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Journal of Environmental Psychology

Academic Press
A Subsidiary of Harcourt Brace, Jovanovich, Publishers
London New York Toronto Sydney San Francisco

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Published quarterly (March, June, September, December) at 24–28 Oval Road, London NW1 7DX, England, by Academic Press Inc. (London) Ltd. 1981, Volume 1. Price per annum: inland £19.50 inclusive of postage and packing; abroad $58.00 inclusive of postage and packing. Personal subscriptions: inland £12.00 inclusive of postage and packing; abroad $35.00 inclusive of postage and packing. Personal subscription rates are available only on orders placed directly with the Publisher and paid for out of personal funds.
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Postmaster, send changes of address to *Journal of Environmental Psychology*, 111 Fifth Avenue, New York, N.Y. 10003. Air freight and mailing in the U.S.A. by Publications Expediting Services Inc., 200 Meacham Avenue, Elmont, N.Y. 11003, U.S.A.
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ENVIRONMENTAL PSYCHOLOGY

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Abstract

The origins and development of environmental psychology are summarized and a general definition of the field is offered. Its current vigorous state is held to be a product both of the way its practitioners have met the challenges of application and of the benefits accruing from the cumulative impact of several scientific research traditions. Whilst the core of the field is appropriately placed within the discipline of psychology, its strength derives also from continuing transactions with other disciplines. One major conclusion from considering the early and recent development of the field is that any premature or narrow definition of it could reduce its future vitality.

Introduction

The advent of a *Journal of Environmental Psychology* gives expression to the coming of age of a distinct and viable field. Evidence of accomplishment and vigor can readily be cited. In a recent review, Stokols (1978) noted the appearance over a five-year period of ten text-books, six edited readers, and over thirty state-of-the-art volumes devoted to specific aspects of the interplay between behaviour and environment. The field of environmental psychology has been recognized for inclusion in the *Annual Review of Psychology* (Craik, 1973; Stokols, 1978) and as worthy of a place in such encyclopaedias as Wolman's (1978). *Environment and Behaviour*, under the pioneering editorship of G. H. Winkel since 1969 is making a successful transition to the new editorial team of R. B. Bechtel and W. H. Ittelson. The American Psychological Association has established its joint Division 34: Population and Environmental Psychology, which supports the journal *Population and Environment*. The Environmental Design Research Association (EDRA) continues into its second decade of annual meetings and published proceedings.

Outside of North America the early activities in Britain (Canter, 1970; Honikman, 1971) and Scandinavia (Kuller, 1973) have evolved into a regular series of European conferences (Korosec-Serfaty, 1976; Canter and Lee, 1974). International meetings as far apart as Turkey (Gurkaynak and LeCompte, 1979) and Australia (Architectural Psychology Research Unit, 1976) are becoming commonplace. A meeting in Tokyo in September 1980, under the title 'Japan–US Seminar on Interactive Processes in Human Behaviour' also shows that strong international links are being forged. The International Association of Applied Psychology (IAAP) has recently launched a new Division of Environmental Psychology and a new International Association for the Study of People in their Physical Surroundings (IAPS) has been established. An

We are very grateful for the full comments made by Ian Griffiths on various drafts of this paper.

0272–4944/81/010001 + 11 $02.00/0 © 1981 Academic Press Inc. (London) Ltd.

extensive review of German research has appeared (Kaminski, 1978) and the first French textbook has been published (Levy-Leboyer, 1980). The dissemination of the literature in the field has been further enhanced by the translation of English texts into Japanese, Spanish and German (Striffler, 1973; Miyata, 1979; Dozal, 1979) and the translation of Levy-Leboyer's French text 'Psychologie et environment' into English (Canter and Griffiths, in press). The establishment in Sweden, in 1980, of the first Chair in Environmental Psychology also serves to show that these world-wide developments are finding high level institutional support.

Given these advances of the 1960s and 1970s, what about the 80s? Is environmental psychology prematurely dying (Taylor, 1980) or does it instead hold a blueprint for the future (Sommer, 1980)? Perhaps even for the future of the whole of psychology (Ellis, 1980)? Certainly the international developments cited suggest an encouraging positive forward movement. The inauguration of this *Journal* is a response to the demonstrably international nature of the field.

A General Definition

Not surprisingly, the diversity of backgrounds and locations, both geographical and institutional, of contributors to the field has generated many different views of environmental psychology. The following general definition might rally a modest consensus, or at least serve as a benchmark for further discussion.

> *Environmental Psychology is that area of psychology which brings into conjunction and analyzes the transactions and interrelationships of human experiences and actions with pertinent aspects of the socio-physical surroundings.*

It is important to emphasize that whilst the field of environmental psychology is clearly an area within psychology, the multi-disciplinary nature of the problems studied inevitably require that the concepts, methods and personnel involved in the field will be drawn from many parent disciplines.

Early History

Obviously, within psychology, one major distinguishing feature of the field is its focus upon the physical environment. Curiously, it need not have been surprising had such a focus emerged in the 1860s rather than the 1960s, as a straightforward extension of Fechner's psychophysics and his concern with the link between psychological sensation and physical stimulus. With perhaps equal cogency, it might be argued that an environmental psychology need never emerge as a distinct field. After all, the analysis of stimulus and response, environment and behaviour, setting and action pervades all of psychology. However, the development of science is not an abstraction but a socio-cognitive process which unfolds in specific societal and intellectual contexts (Kuhn, 1962).

In what might be regarded as the pre-history of environmental psychology, the late 1940s and early 1950s, geographers in North America (cf. White, 1961; Lowenthal, 1967) and sociologists and psychologists in Britain (Chapman and Thomas, 1944; Langdon, 1963), responding to the political influence of social democracy, began to examine lay conceptions and evaluations of the physical surroundings. This work was largely unheeded by a generation of social scientists schooled in the confusions of the Hawthorne investigation and its popular interpretation as revealing the

insignificance of the physical surroundings (Landsberger, 1961). Even for those who might have been able to move beyond this implicitly mechanistic framework, the lure of a laboratory-based social psychology hid from them the import of the environmental questions being asked. Notable exceptions to this masking effect of the laboratory focus can be found in the work of Festinger and his colleagues (1950), Barker and Wright (1955) and Mintz (1956) as well as then unpublished PhD research by Lee (1954). But it was not until the field was given the label of Architectural Psychology in the late 1950s and early 1960s (Bailey *et al.*, 1961; Canter, 1970; Kuller, 1973) that it became recognized as a potentially distinct aspect of psychology.

In this early period of the field, a dominant impetus was provided by the emerging responsiveness of post-war architectural designers and planners, often initiated by their political masters, to the requirements of the future users of their creations. This was, in part, a product of their being confronted with large scale urban renewal projects, new town developments and major state buildings. As Langdon (1966) pointed out, it was the first time that professional architects and planners recognized that they could no longer fully know and understand the future inhabitants of their buildings in the way that had been possible when architects usually worked closely with and for private patrons.

Furthermore, the application of relatively new and high technology to buildings in the post-war period also meant that problems arose in the design of internal environments which had not had to be faced before. Lighting, for instance, had to be reappraised in terms of its capacity to meet human requirements for visual performance (Blackwell, 1972; Boyce, 1973) and in terms of its subjective effects (Epaneshnikov and Sidorova, 1965; Lynes, 1972; Flynn *et al.*, 1973). The advent of the totally controlled environment meant that human response to windowlessness became a research area (Larson, 1965) and the functions of windows (often reduced in size) were reassessed (Wells, 1964; Markus, 1967). Similarly, air-conditioning, heating and ventilating technology moved on so that a solely physiological model of human thermal comfort could no longer be considered satisfactory (Fanger, 1970; McIntyre and Griffiths, 1974; McIntyre, 1980).

Certainly, in the early days of the field, the questions posed by decision makers to psychologists concerned environmental variables which were quite different from the stimulus conditions examined in traditional laboratory studies. Yet it was not until the public identification of an environmental crisis, in the late 1960s and early 1970s, that a second period of rapid growth in environmental psychology directed psychologists' attention to a much wider set of environmental issues, including various aspects of pollution (Lindvall, 1970), urban noise (Griffiths and Langdon, 1968), and the monitoring of environmental quality (Craik and Zube, 1976).

As we enter the 1980s, a wide range of seemingly disparate studies are actually organized, directly or indirectly, by issues of energy supply and demand. Technological factors in generating and delivering energy, such as surface mining of coal, siting of power plants, routing of transmission lines, and onshore facilities for offshore oil drilling entail physical changes whose impact upon scenic quality must be appraised, understood and, if possible, mitigated (Zube, Brush and Fabos, 1975; Elsner and Smardon, 1979). The perception of risks incurred by nuclear energy and related modes provides the occasion for psychological analyses of risk assessment (Kates, 1978; Fischhoff *et al.*, 1978). On the demand side, efforts to promote conservation have lead to research on consumer attitudes and behaviour (Cone and

Hayes, 1980; Stern and Gardner, in press). Finally, modifications in building practices, which combine increasingly air-tight construction (to reduce energy usage) with synthetic building materials has lead to deleterious effects upon inhabitants and instigated psychological research on indoor air pollution (Berglund and Lindvall, 1979). Thus, with the turning of popular attention to energy consumption and the changes in society consequent on economic and technological developments, the environmental components of these trends are being added to the range of topics addressed by environmental psychologists, contributing to the very broad framework of issues which characterizes the field today.

The Challenge of Application

The impetus of new applied problems has often energized environmental psychologists, paradoxically, by revealing engaging puzzles which lend themselves to several mature research paradigms. These strands of normal science (Kuhn, 1962) with their ready at hand concepts, methods and trained practitioners have, without doubt, facilitated the field's quickly attained levels of high research productivity. Relatively autonomous and internally coherent programmes of research now exist in environmental perception, ecological psychology, personality and environment, environmental cognition, behavioural modification, environmental assessment and environmental stress (Craik, 1977; Stokols, 1978). They join with more mission oriented sets of projects on therapeutic facilities, schools, wilderness use, urban crowding, and the acoustic environment to generate the vitality but also the complexity of the field's basic scientific fabric. Presenting formidable challenges for greater conceptual integration, they highlight the need to ensure that broad and imaginative theoretical efforts at the psychological level be pursued alongside interdisciplinary and applied research.

The role of interdisciplinary contact in applied contexts was prevalent in the initial emergence of the field. Many of the early studies, for example, were concerned with or carried out within psychiatric facilities bearing upon medical concerns to improve patient wellbeing. Furthermore, a number of the early researchers, such as G. H. Winkel, R. Sommer, K. H. Craik, received their graduate training in the applied framework of clinical psychology programmes. Indeed, possibly the first conference which can be recognized as having an environmental psychology focus was devoted to the re-design of mental hospitals (Good *et al.*, 1965).

Since those early days, a continuing interest in the whole range of therapeutic environments (Canter and Canter, 1979) has given rise to practical consequences. Lawton (1979) for example, has built a very effective bridge from studies in gerontology to issues in the design of accommodation for the elderly, directly influencing the planning of a new building in Philadelphia. More recently, that least therapeutic of institutions, the prison, has come under the scrutiny of environmental psychologists (Wener and Olsen, 1978; Ambrose and Canter, 1979), taking the field into areas of penology and the law.

Both the established and emerging themes of environmental psychology, then, underscore its inherently interdisciplinary and applied nature. Further, they suggest that the range of linkages with other disciplines and professions has not been thoroughly explored nor fully established. Of course, a high degree of common long-term intellectual interests is shared with certain other sciences. The mutual relevance

of geography and environmental psychology is a case in point. At the same time the arena of applied research may be the most effective context in which psychologists are forced to discover and fully comprehend conceptions of environment new to themselves. For example, recent developments of applied research find psychologists dealing with the environmental conceptions of energy policy analysts, fire precaution experts, criminologists and technological risk assessors. Thus, the moving edge of the field's substantive domain may well be powered by an enterprising applied psychology.

Developing Conceptualizations

In one sense, the history of psychology reflects our broadening attention to an even wider range of environmental conceptions. Fechner, after all, was a professor of physics (Boring, 1950), and dealt psychologically with the environment at that level of analysis. In the 1930s, Tolman (1932) and others had sought a conception of behaviour *qua* molar and by implication an environment *qua* molar (Craik, 1970). Instead, the physicists' conception of the environment predominated until the emergence of environmental psychology.

The implications for understanding behaviour that follow from the conceptions of environment held by architects, urban designers, engineers, resource managers and other environmental scientists and professionals with whom psychologists now collaborate are far from fully examined. At the very least these multifarious views of environment have alerted psychologists to the interplay of cognitive processes and individual variations in construing the world. Thus, whilst there are dissenting voices (e.g. Wohlwill, 1973), most psychologists adopt a constructivist stance toward the concept of environment. Through this influence, lay conceptions of the environment have been recognized (Canter and Stringer, 1975), as well as the various scientific, professional and even legal conceptions.

Beyond this acceptance of the richness of ways of thinking about the core concept of environment has been an evolving quest for the most appropriate units of analysis —a search not dissimilar to the attempts to define atoms and molecules in the early days of chemistry, or ecosystems in biology. The most worthwhile measurements and attributes of these units has also been a topic for debate since the earliest days of the field (Craik, 1971, 1981). Pertinent issues range widely, including technical details, such as whether lighting is best measured on a horizontal surface or a cylindrical or spherical one (Lynes, 1972); the meaning of psychological concepts such as privacy (Wolfe and Langer, 1974); adaptation of Barker's unit of the behaviour setting (Wicker, 1979), and the current examination of the concept of place and its potential as a technical term for the environmental 'molecule' (Tuan, 1977; Canter, 1977; Stokols, 1981). The relationship of these explorations to developments in social psychology has also been highlighted through such seminal works as Altman's (1975).

One encouraging sign in the recent literature is the gradual forging of linkages between lines of research initially undertaken within environmental psychology and conceptual formulations in cognitive psychology. A substantial number of studies have been devoted to ways of characterizing everyday environments, usually with some form of bipolar rating scales. By applying an array of response formats (e.g. rating scales, similarity judgments) and analytic techniques (e.g. factor analysis, multidimensional scaling) in studying response to a common set of environmental scenes,

Ward and Russell (in press) have indicated that (1) affective environmental meaning can be summarized in a two-dimensional space (pleasure-displeasure; arousal) and (2) the domain of perceptual-cognitive categories is less well mapped than the affective domain and requires systematic taxonomic analysis. Additionally, it would appear that the conceptual frameworks of Brunswik (1956), Rosch (1978) and Zadeh *et al.* (1951) offer resources for making advances on the latter task (Ward and Russell, in press; Craik, in press). Cognitive representation of the large scale environment is a second well-researched topic in environmental psychology (Downs and Stea, 1973; Moore and Golledge, 1976). Recent evidence supports the hypothesis that such representations contain reference points that function analogously to Rosch's (1975) prototypic members of natural categories. Thus, for example, distances between reference and non-reference points are asymmetric, with the latter estimated nearer to the former than conversely (Sadalla, Burroughs and Staplin, 1980). These findings and those from related studies (Kozlowski and Bryant, 1977; Baird, 1979; Cadwallader, 1979; Evans and Pezdek, 1980) demonstrate that on this topic as well, the cumulative impact of research is beginning to yield dividends.

In the more directly applied context the accumulation of research findings is encouraging too. Investigators on both sides of the Atlantic have shown the part played by organizational structure in the utilization of space in therapeutic settings (Canter, 1972; Rivlin and Wolfe, 1979). These findings serve to highlight the significance for environmental evaluation of the social role a person plays in that environment. A number of studies have shown the large differences which can exist in the conceptual frameworks held by different role groups in the same setting (Sewell, 1971; Sandahl, 1974; Canter and Walker, 1980). The stability of these role differences is even maintained in the face of fire emergencies (Haber, 1980; Edelman *et al.*, 1980; Canter *et al.*, 1980). Here, then is a recurrent finding that has policy implications for life safety.

Future research is likely to link these patterns of role differences, which have been so consistently found in studies of hospitals and major building fires, to the perceptual-cognitive consistencies found in laboratory simulations. Early attempts at a rapprochement between issues evolving directly from theoretical concerns and those originating in problems of policy formulation (e.g. Groat and Canter, 1979) do appear to provide a bridge to the writings of architectural critics, as Groat (1981) has illustrated. The interplay between theory and practice, and among the various disciplines which contribute to environmental psychology, is clearly generating a rich range of concepts and methods with great potential for further development.

What is exciting about current activity in the field is that research effort is now apparent in both theoretical and applied domains and that the distinction is narrowing between these focii of concern. In our historical overview we have tended to emphasize the role of applied and policy issues in giving impetus to the field. Whatever sources of motivation the desire for applicability provided in the past it is less identifiable as a separate source today. Theoretical concerns arising from ecological psychology, models of stress, proxemics, person by situation analysis and adaptation theory all serve as sources of vitality for current developments.

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Conclusion

This perspective on the field carries the warning not to restrict its definition and domain through premature and overly narrow definition. For instance, any formulation of the field based solely upon issues derived from architectural design and urban planning would not have anticipated the research topics subsequently generated by the environmental movement and the current concern with energy policy. A difficult balance must be achieved to avoid the abandonment, when the popular interest in them wanes, of earlier topics which have been only partially examined, whilst at the same time preventing foreclosure to new themes and responsiveness to contemporary public concerns. For even in the past few years the expansion of the issues dealt with within the field has been impressive.

With the proliferation of topics in the field, one urgent direction for the future is the development of a coherent core which will clarify the distinctness of environmental psychology. In the past, new fields of scientific endeavour have sometimes lost their impetus and their contribution has been reduced by their absorbtion into established disciplines before they have evolved their own classes of research questions, theories and methods. Unfortunately, within environmental psychology integrative conceptual contributions have been rare, even though conceptual advances are urgently needed to provide or support a viable sense of coherence for the field. What is even more distressing is the present lack of vigorous conceptual discourse. Proponents of even modest new conceptual formulations are seldom greeted with informed commentary or close critical appraisal. If any response occurs at all, it more likely takes the form of an alternative conceptual scheme that fails to engage the earlier in any substantive way. The Journal will seek to promote livelier and more productive theoretical exchanges.

We have elected in these comments to render a broad-brush sketch of environmental psychology as it appears early in its second decade, rather than to attempt forecasts of its likely state ten years hence. It is our hope that during this period and beyond, the Journal will contribute usefully to the scientific development of environmental psychology as an international field of inquiry. It will strive to do so by (1) publishing original empirical and conceptual articles that advance understanding of the interaction of individuals with their surroundings, (2) presenting critical surveys of the research literature and reviews of books and other major publications, and (3) serving as a forum for discussion of the history, progress and direction of environmental psychology and its relations with other areas of psychology and with related disciplines and professions.

Note

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Manuscript received: 12 December 1980
Revised manuscript received: 2 February 1981

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THE BEHAVIORAL ECOLOGY OF SUPERMARKETS AND FARMERS' MARKETS

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Abstract

A comparison was made of the social and physical milieu of supermarkets and farmers' markets in ten California cities. On the semantic differential, the farmers' markets were perceived by their customers as more friendly, personal, rural, smaller, and happier settings than were the supermarkets by their customers. More than three-quarters of the supermarket shoppers arrived alone while at the farmers' markets, more than three-quarters arrived in the company of others. Interaction counts showed a similar number of perfunctory conversations in the two settings but more social and informational encounters at the farmers' markets. The lack of extended interaction in supermarkets is seen as a function of its social organization, relatively low density, and traffic-dominated architectural layout.

Introduction

The supermarket has come to symbolize American 'vigor, ingenuity, and abundance.... Life Magazine labeled it "a U.S. institution", and at foreign expositions, the supermarket has become a showpiece' (McAusland, 1980). The American supermarket continues to impress visitors from other nations with its abundance of products, brands, bright and colorful decor, and efficiency of layout. However, these same visitors frequently comment on its sterility and standardization which 'take away the social pleasure of shopping' and remove the vitality, excitement, and the exchange of opinion and gossip of the traditional marketplace (Isogai and Matsushimi, 1972). A French visitor observed that American supermarkets 'all look alike and you can do your entire shopping without exchanging a word with anybody' (Griswold-Minois, 1980). Various American writers have describe the supermarket as one of the more alienating public settings (Cross, 1975; Burke, 1978; Silverstein and Jacobson, 1978). Publications of the food marketing industry devote a considerable amount of space to the physical and organizational aspects of the supermarket, but there is little interest in the idea of the supermarket as a place where people meet and converse. To use Osmond's (1957) term, the supermarket is not designed to be a sociopetal setting.

The inclusion of the supermarket in the list of institutions that depersonalize social contacts is not surprising since many definitions of the supermarket require the grocery department to be fully self-service which means that employees will be removed from the proximity of the food items. Technically such an environment could still be a friendly place for customers, but the physical layout in which the aisles are transit space precludes this. According to Beckman and Nolen (1976), the tempo of a success-

This study was supported in part by a grant from the Kellogg Public Service Research Program.

0272-4944/81/010013 + 07$02.00/0 © 1981 Academic Press Inc. (London) Ltd.

ful modern retail business is much too fast to permit extended social intercourse between a clerk and customers or among the customers themselves.

Virtually all of this criticism of supermarket atmosphere has been at a journalistic level. There has been little attempt to document empirically the amount or quality of interaction in this setting. Shopping for food and other necessities in a community market has been a cohesive force in developing nations throughout the world. We therefore decided to compare the social life in supermarkets with that in farmers'

FIGURE 1

FIGURE 2

markets in the same cities. Farmers' markets are outdoor settings in which small farmers gather to sell fruits and vegetables directly to the public, usually from the backs of pick-up trucks or on makeshift tables. They have also been described as tailgate or curb markets. As Figures 1 and 2 indicate, the scale, spatial flow, and physical attributes of the two settings are very different. The supermarket is indoors, linear, and highly structured. Most farmers' markets are outdoors, non-linear, with customers going back and forth checking the prices of different vendors, and loosely structured. The main hypotheses were that the farmers' markets would be perceived as friendlier settings than the supermarkets and have a higher rate of interaction both between customers, and between customers and employees/sellers.

Methods and Results

The first method used to study social atmosphere involved the semantic differential. A brief questionnaire containing ten polar adjective pairs was given to 171 customers at 28 chain supermarkets in 12 California cities and to 178 customers at farmers' markets in the same cities. Each respondent was approached either in the parking lot of the supermarket or in the farmers' market itself. In each case the respondents rated only the single setting in which they were present.

Figure 3 shows that the farmers' market was perceived by its customers as a more friendly, personal, rural, smaller and happier setting than was the supermarket by its customers. All differences were significant at the 0·01 level by *t*-test except for the fast–slow dimension where there was no reliable difference between the two settings. However, in absolute terms, the supermarket is considered a friendly, happy and sociable environment by its customers, although less so than is the farmers' market by its customers.

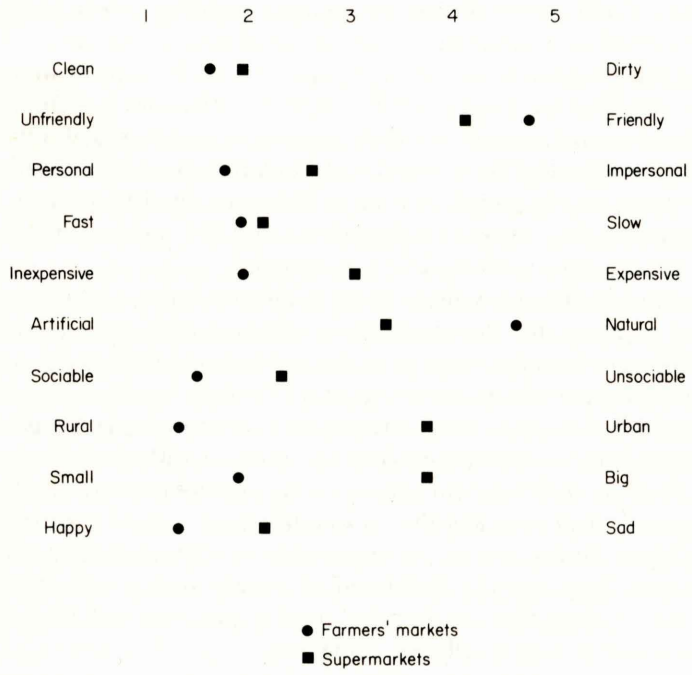

FIGURE 3. Semantic profiles of farmers' markets and supermarkets.

Another index of social atmosphere is the number of people arriving alone. While this does not guarantee a lack of interaction since people who are alone can presumably meet others, it suggests a lack of contact especially during focused visits of limited duration. A count was made of the shoppers arriving alone at three supermarkets and a farmers' market in one of the cities in our sample. The observer spent as much time as was needed to count how many among 100 consecutive customers, during each of a morning, afternoon, and evening period, came alone or in groups. Adults accompanied only by very young children were counted as being alone. Since there were no significant differences in the proportions of lone and group customers coming to the supermarket at different times of the day, all time periods were combined to yield a total of 84% of the 900 supermarket customers arriving alone and 16% in groups. Of the 248 customers counted at the farmers' market (it was held only during morning hours), 25% came alone and 75% arrived in groups.

Interaction counts were made through an application of Barker's (1968) psychological ecology in which a researcher follows an individual through various settings and records their actions. The observations were unobtrusive and non-reactive. The observer carried a stopwatch in his pocket and recorded the time that the individual spent in the store as well as the number of social encounters that ensued. Interactions were classified into three categories and the role-identity of the other party was recorded (clerk, cashier, customer, etc.).

(1) *Perfunctory*—an acknowledgment of another persons presence which did not necessarily require response. Examples: 'Excuse me.' 'How's it going?' 'Have a good day.'

(2) *Informational*—either asking a question or providing an answer. Examples: 'Where is the tomato juice?' 'How much are the melons?'

(3) *Social*—a conversation between two or more people on any topic. While perfunctory and informational transactions probably will be shopping-related, the subject of a social encounter can be almost anything.

Recording was made on small pieces of paper as if the researcher were checking off items from a shopping list. The two observers were both males in their twenties. There were nine observational sessions in which the same customer was observed by the two researchers independently. These sessions took place in five supermarkets. There was perfect agreement on the length of time in the store, the role-identity of the other party of the interaction (customer or employee), and 92% agreement in classifying the interaction as perfunctory, informational, or social.

The main observations took place in ten California cities, and involved a total of nine farmers' markets and 26 supermarkets affiliated with national chains. Table 1 shows no difference between settings in the number of perfunctory encounters, but more informational and social encounters at the farmers' markets. Overall, there were about two and a half times as many encounters per person at the farmers' markets as in the national chain supermarkets and the greatest differences between the two settings occurred in informational and social encounters respectively. For the supermarket customer, there was less than a one in ten chance of a social contact with another customer during any single visit to the supermarket. For someone at the farmers' market, there was the likelihood of social contact with another customer during two out of three visits. A farmers' market customer was four times as likely to have an encounter with a seller or employee.

In interpreting these data, it is necessary to take into account the time spent by

TABLE 1
Average number of interactions per capita in each setting according to type of interaction and recipient

	No. of observations	Perfunctory interactions with		Informational interactions with		Social interactions with	
		customer	employee	customer	employee	customer	employee
Chain supermarkets	128	0·05	0·50	0·06	0·53	0·09	0·14
Farmers' markets	43	0·26	0·35	0·02	1·98	0·63	0·42

individuals in each setting. Analysis of the data showed that the length of time people spent in the market did not differ significantly between settings, averaging about ten minutes per shopping trip.

Density is another relevant variable. It was not feasible to undertake density counts at the farmers' markets because of the fluid nature of the setting which put the task beyond the reach of a single observer. Ratings of density were, therefore, made only at the supermarkets. The index used was the number of customers passed by the observer while tracking a single subject. These were all shoppers passed in the aisles and not those at the checkout stand. *Light* density was defined at 0–5 shoppers passed, *moderate* density as 6–10 shoppers passed, and *heavy* density as 11 or more shoppers passed. Overall, there were 42 observation sessions when traffic was defined as light, 53 when it was moderate, and 32 when it was heavy. There was a clear linear relationship between traffic density measured in this way and the likelihood of a customer being involved in interaction. When traffic was light, customers averaged 1·00 encounters, compared to 1·45 when traffic was moderate and 1·97 when traffic was heavy. At each density level, there were five times as many perfunctory and informational encounters as social encounters.

Discussion

These results indicate that the supermarket is a less friendly environment than the farmers' market. There seems some likelihood that this difference is at least partly the result of deliberate design which puts primary emphasis on efficient circulation and exposure to a wide range of products. The supermarket contains no conversational areas or secluded nooks out of the traffic flow or chairs where people can sit and rest or chat. Spaces are intended for display or movement. The checkout line produces propinquity but the physical arrangement of people one behind the other alongside shopping carts does not encourage conversation. The height of the shelves precludes communication between people in different aisles. Shoppers at the farmers' market, however, are free to talk across the low stands or cartons containing fresh produce. Physical objects at the farmers' market serve more as bridges than barriers. Farmers' market customers carry hand baskets and paper bags which don't increase conversational distance or block interaction to the same degree as shopping carts.

The social organization of the supermarket which separates employees from customers contributes to the low rate of interaction. The customer who comes upon a clerk stacking cans or stamping prices is likely to feel apologetic about bothering this busy person. Although the clerk will be polite and helpful, it is clear to both parties that the clerk's primary duty is servicing the merchandise rather than the

customer. Management is generally located in a remote area out of the main traffic flow, perhaps behind a glass partition. The only employee that the customer will routinely encounter is the checkout clerk under conditions not likely to provoke more than a brief encounter.

The most obvious reason for the relatively larger number of informational exchanges at the farmers' market is that there is someone around to answer questions unlike the supermarket where clerks are out of view most of the time. Whereas the supermarket is designed to minimize contact between customers and employees, the reverse attitude prevails at the farmers' market. We found a number of sellers who encouraged conversation about the specific variety of produce, how it was grown, how it could be used.

Without further research we cannot say that the low level of interaction of American supermarkets is characteristic of supermarkets in other nations, but this seems tenable hypothesis since the physical form and organization of stores is similar throughout the world. However, European supermarkets tend to have much higher density than their American counterparts and this is likely to affect interaction rates. The farmers' markets included in the present study represent a unique institution since their form and layout revolve around the pick-up truck from which farmers sell their produce. Community markets in other nations often involve permanent or semi-permanent stalls, tents, or buildings in which vendors sell their wares. They have more color, odors, and noise from constant haggling and bargaining than do American farmers' markets.

Where supermarkets coexist with community markets in developing nations, supermarkets draw from the upper economic strata and the community markets from the lower economic strata. All the studies that have been done in American farmers' markets show somewhat the reverse trend, with the farmers' markets attracting customers whose income level is above that of the region and whose primary interest is in food quality (Roy, Leary and Law, 1977; Sommer and Wing, 1980). Care must be exercised in generalizing from American farmers' markets selling only fresh local produce to the public markets of other nations that distribute all vital necessities.

Improving the social milieu of the supermarket would probably require substantial modification of the present architectural system (Lozar, 1974). This could involve interruption of the traffic-dominated layout and the establishment of social centers including soda fountains, conversational nooks, child care centers, and other places physically removed from the major traffic flow. Meeting a friend in a narrow aisle is not likely to result in conversation when there is no place to stop and chat without blocking traffic. It is also difficult to walk side-by-side pushing wagons down a narrow aisle or attempt a conversation wheeling a cart in front or behind another person. The most likely outcome of this sociofugal design (Osmond, 1957) is that customers will restrict their meetings to brief perfunctory exchanges. The checkout line is a poor place for meeting others and the cashier calling out prices while ringing them up on the register cannot dally in conversation while other people wait impatiently in line for the customer to finish and leave. Nor is the parking lot suitable for conversation because of traffic noise, noxious fumes, and the unappealing surroundings.

These trends toward desocialization of the marketplace are accelerating. The introduction of laser scanners and other labor saving devices will eliminate various employee positions and speed up the checkout process. Another technical development under consideration is the use of advertising messages shown on television

monitors located above the checkout stand. Considering that presently the bulk of interactions in supermarkets are perfunctory encounters with the cashier, such developments should further desocialize the shopping experience.

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Manuscript received: 12 August 1980
Revised manuscript received: 31 October 1980

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THE CASE FOR DEVELOPING A COGNITIVE ENVIRONMENTAL PSYCHOLOGY THAT DOES NOT UNDERESTIMATE THE ABILITIES OF YOUNG CHILDREN

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Abstract

Both developmental and environmental psychology, where influenced by the work of Piaget, tend to have underestimated the environmental skills and potential of young children. This paper argues that what is needed is a cognitive environmental psychology which derives from observations of young children's real-life behaviour in their everyday environment, as well as from the laboratory-based studies which predominate in the field. Much of the present evidence on young children's capabilities in cognitive mapping and other locational skills comes from studies by geographers and educationalists; whereas psychologists have concentrated in their small-scale laboratory studies upon the processes whereby the child learns and uses information about the physical environment. Combining findings from both laboratory and large-scale settings, it is now possible to describe a developmental sequence; although many more naturalistic as well as experimental studies are needed.

Although empirical studies of environmental cognition must now be numbered in hundreds (Moore, 1979) and some proportion of these have been devoted to ontogenetic developmental changes in environmental cognition, it is the argument of the present paper that, despite the existence of these studies, there is a considerable underestimation of the environmental skills and potential of young children and expecially those below five years of age. What is needed is a cognitive environmental psychology geared to such an age group and its real-life behaviour in the everyday environment; and not just a predominantly laboratory-based one which treats young children as imperfect apprentice adults.

Theoretical expectations of what young children are capable of have been influenced by Piagetian developmental psychology, and, in particular, by Piaget and Inhelder's (1967) use of the 'three mountains experiment' to demonstrate the young child's egocentricity in perspective taking. Piaget and Inhelder further suggest that the reproduction of a model landscape layout is dependent upon the co-ordination of perspectives which they find is usually achieved at about nine to ten years old (their sub-stage IIIb); and that formal mapping operations are not fully attainable until about 11–12 years (their Formal Operations stage). However, as Hart (1979) and others have argued, much of the younger child's apparent difficulty is occasioned by the mode of presentation of the test material; and a number of developmental psychologists broadly within the Piagetian tradition have, by using altered methodologies, shown that young children do not necessarily view the world as egocentrically as Piaget and Inhelder have stated (e.g. Huttenlocher and Presson, 1973; Liben, 1978; Kurdek, 1978).

There has been rather less tendency to underestimate the young child's capacity

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to structure environmental information on the part of some psychologists from other traditions, and by some behavioural geographers. The cognitive psychologist, Neisser (1976) for example, argues that very young children and even babies show by their actions in everyday environments that they possess what he calls 'orienting schema': cognitive maps of those portions of the local environment through which they travel, and containing the permanent and recent locations of objects important to them. Neisser is clear about the methodological problems of working with young children:

> 'Cognitive maps are defined by information pick-up and action, not by verbal description. Travel is one thing, travelogue another. A child can find his way long before he can give an adequate account of where he has been or how he got there.'

Thus, although the cognitive maps of adults have been investigated by getting subjects to externalize them by drawing sketch maps ever since Lynch's (1960) pioneering research, such exercises are much less appropriate for children who lack the drawing skills to produce a map of sufficient clarity and accuracy to represent their environmental knowledge. [The extent to which such 'graphicacy' is an intervening factor in the mapping exercises of *adults* has often been conveniently ignored by investigators, but can quite easily be demonstrated (see Murray and Spencer, 1979).] Considerable ingenuity and patience are needed in developing and working with alternative means of investigating the environmental cognitions of young children; and the remainder of the paper will discuss studies which have evolved a great variety of such techniques.

Have We Underestimated Young Children's Environmental Cognition?

Some of the strongest claims for young children's possessing relatively complex environmental cognitions have been made by geographers (e.g. Blaut *et al.*, 1970; Piché, 1977; Catling, 1979).

Blaut and Stea (1971) showed children of five years and older aerial photographs, and, finding them able to interpret several geographical features in each, have argued that children are able to engage in the fundamental processes needed for map making and map reading (namely, rotation from horizontal to vertical views, reduction in scale, and abstraction to semi-iconic signs) long before they are exposed to traditional maps. Children who have never interacted with large spaces can nevertheless interpret the aerial properties of such spaces, and solve mapping problems concerning them. Blaut and Stea suggest that 'we can explain these abilities only if we assume that a very highly evolved cognitive map has already been formed in many children by the age of five'.

Experiences contributing to such a map are likely to include not only the child's active movement through space (the mobile observer in a stationary environment) but also the stationary spectator in the 'mobile environment' afforded by film and television. (Note, however, that Blaut and Stea were able to show a level of interpretation of aerial photographs by Puerto Rican children which was comparable to that of their mainland U.S.A. children, although the exposure to the visual media of the former group was reported to be limited.) The child's toy play is also claimed to be an important experience, enabling as it does active control over a miniature environment. The child chooses the positions of toy versions of objects relative to each

other, and himself moves through and above this world, continually changing perspectives. Blaut and Stea stress the role of toy play: it gives the child experimental control over what would otherwise be, to him, impossible environments and viewpoints. Clearly, such play is characteristic of children much younger than five years of age; in most cultures, adults provide some kind of toy models of everyday objects for children, or children improvise them for themselves; and children from an early age can be observed delighting in organizing and moving toys, and in repeatedly changing perspectives. One pattern we have frequently observed is the child, having played with, for example, a model car by kneeling over it to push it, then lies down flat to observe the car moving past at eye level. An accumulation of many such switches from plan to elevation, and from distant to close-up viewpoints must surely develop interpretative skills which could be translated to the full-scale environment, and representations of it. We need further empirical work to test whether such experience manipulating self and *objects* to get different perspectives does actually transfer to interpreting relations about largely non-manipulable spatial layouts.

It is indeed possible to demonstrate the ability to interpret aerial photographs in children as young as three years of age (Spencer *et al.*, 1980): children who in Piagetian terms are clearly at a pre-operational stage, yet who found few problems in interpreting photographs comparable with those used by Blaut and Stea. In this study, all 30 children in the sample, without hesitation or need for prompting interpreted the photographs as being in some way geographical ('There are roads and houses'; 'It's a town', etc.) rather than as, for example, a pattern of lines or shapes. The children used the context then to interpret further: e.g. 'If these are roads, then are these cars?' None of the children claimed having seen such photographs before, or could explain how they could have been made (in contrast with primary school children, many of whom would imply an aerial perspective by mentioning an aeroplane). Revealingly, many of the three-year-old children in the Spencer *et al.* study referred to railways in one of the photographs by the proprietory name of the toy train tracks that all regularly played with in the nursery school they all attended: further indication that Blaut and Stea may well be right to stress the importance of toy play in the construction of geographical images.

How significant are such findings? Piché (1977) has argued that such decoding and recognition is a relatively easy task, based upon the principles of object perception, compared with the kind of encoding and reconstruction involved in the mapping exercises, which are dependent upon higher logical operations. She is more cautious than Blaut and Stea when describing the child's abilities *vis-à-vis* the large scale environment:

> That children can find their way in the neighbourhood does not mean that they have completed their representation of it ... it is possible that they only imagine the roads very concretely, like corridors, and that their displacements from them are guided by perceptual cues.

Piché's own experimental work with primary school children would seem to bear this out: she describes a series of cognitive stages through which the child passes before he develops a continuous, spatial image of the neighbourhood. These stages, starting with particular routes, then linking routes, and eventually building a neighbourhood map upon this network of routes, is very reminiscent of several accounts which have been given of the stages an adult may go through when

rapidly developing his cognitive map of a novel area (e.g. Appleyard, 1970; Gittins, 1969; Spencer and Weetman, in press): a case of ontogenesis prefiguring microgenesis?

Even adopting the cautious theoretical position advanced by Piché, the performance of her youngest (i.e. five-year old) subjects demonstrates a degree of geographical competence which would not be predicted from an orthodox Piagetian view.

A further strong piece of evidence that young children's ability has been underestimated is given by Bluestein and Acredolo (1977). Three- to five-year old children were asked to identify and find items in a room using a simple map under a variety of conditions. Most three-year olds were able to perform these rudimentary map reading exercises when the map was correctly aligned inside the room; by four-years old the child could typically retain and use the map image when he had been shown it, correctly aligned, before entering the room; and that five-year olds were not even dependent upon a correct alignment of the map. Thus, it seems that young children are able to comprehend simple drawn maps, and to use an image of them to problem solve in at least the immediate situation.

Small-scale, Analytical Studies of Young Children's Abilities

Many of the studies which have investigated age-changes in children's locational and geographical competence have deliberately placed their subjects in limited environments—a room, a corridor—and studied one selected aspect of the child's capabilities. Acredolo *et al.* (1975), for example, had children retrace their route along a corridor, and asked them to locate the point at which the experimenter had dropped her key ring on their previous walk together. They demonstrated that the presence of distinguishable landmarks in the corridor considerably aided recognition; and conclude that 'four-year old children are sensitive to the topological relationships of a neighbourhood, to the point that, given landmarks, their performance is as good as that of eight-year olds'.

In another series of such studies, Kosslyn *et al.* (1974) showed that four- and five-year old children were able to make systematic distance judgements from every location to every other location within an experimental room, although they had previously had direct experience with only a few of the possible relations. These authors argue that their data provided further support for the existence of usable cognitive maps in young children. Hardwick *et al.* (1976) set their subjects a triangulation task within a room familiar to the children. They showed that their youngest subjects, six-year olds, possessed very accurate, coherent cognitive maps of this familiar, limited space as conventionally experienced; but found that the six-year olds performed less well than 11-year olds when the experimenter asked them to imagine either the room rotating (mental rotation) or themselves moving within the room (perspective taking). Their conclusion was that, at least on such tasks, there was a considerable increase with age in the accuracy and completeness of the mental manipulation. The six-year olds, unlike the 11-year olds, found especial difficulty with the transformation of ordinal spatial relationships.

Hardwick *et al.*, having presented their experimental findings, then speculate about the implications for the child's use of the large scale environment. They think that, in the broader environment, young children may be unable to abstract what Hardwick *et al.* describe as 'general level representations'—summaries of the spatial

information contained in all the separate specific perspectives with which the individual is familiar.

> If this is the case, then young children would be very limited in what they could do with their cognitive maps ... and (this) would severely limit their ability to plan spatial routes, to communicate directions to others, or to take an imagined perspective within the environment.

Further evidence to suggest that the ability to shift between spatial frames of reference develops considerably between 6 and 11 years of age comes from Cohen *et al.* (1979). In yet another limited-environment and novel-task experiment, children had to estimate the distances between, in the novel condition, six pieces of furniture in an unfamiliar room, or, in the familiar condition, six points in their school library. The younger children could as easily reconstruct the setting—whether familiar or novel—as could the older; but they were significantly less accurate when the tasks involved the rescaling or re-orientating of their representation of the room they had just seen.

It should be noted, however, that such tasks involve more than just the spatial abilities that the authors focus on. Herman (1980) has suggested that the speed of acquisition and the storage of spatial information—both of which can be demonstrated to be age-related—might explain some of the improvement in performance in such supposedly 'cognitive mapping tasks'. In his experiment, children of five- and six-years, and of eight- and nine-years, saw a very simple, eight item, model town; and were then asked to reconstruct it from memory. The older children were more accurate in these reconstructions, regardless of whether the child had viewed the model by walking round its perimeter, by walking along its road layout, or by wandering backwards and forward at will. (It was, incidentally, found that all children developed more accurate maps when their movement and attention were directed by their experimenter than when they wandered at will.)

Herman deduces that the superiority in task performance of the older children must be a function of the speed of acquisition and storage of spatial information, because in other respects older and younger children behaved similarly during the learning phase of the experiment: 'When left to explore the town freely, both groups of children took about the same amount of time and entered about the same number of quadrants.' He admits, however, that the children may have differed in terms of their awareness of the task demands; and that the older children might have developed better strategies for externalizing their mental maps for the experimenter. [That older and younger children use rather different strategies for *searching* their environment has been shown by Wellman *et al.* (1979).]

Laboratory Tests may Underestimate Performance by Young Children in the Familiar, Large-scale Environment

We suggest that laboratory-based and other small-scale tests, such as those reported above, although invaluable in investigating aspects of the development of spatial cognition, tend to underestimate quite how efficient are young children as users of the 'real-world', familiar environment. It should be noted, however, that laboratory-based investigations tend to have as their aim the analysis of the *process* by which some spatial behaviour is carried out, rather than the investigation of the *absolute*

competencies of children. Characteristic of such studies are tasks dependent upon relatively complex verbal instructions, or some relatively novel or unusual behaviour, such as learning to align a sighting tube (as in Hardwick *et al.*, 1976); and younger children's performance on the tasks, although showing some degree of spatial or locational competence, may well be depressed relative to that of older children because of intervening factors such as comprehension of the task, attention span, etc.

Furthermore, most of these studies fail to set the child's performance in the test situation against the context of the everyday environmental competence typically exhibited by children of the same age. More than anecdotal evidence suggests that, in some cases at least, such everyday competence is impressive; and that we are in danger of underestimating it:

> Most mornings, thousands of 6-year-old children will find their way to school. There will be protections along the way, but no-one is particularly worried that the children will get lost. They will find their way to school (often taking varying routes), within the school to their classrooms, after school, perhaps to a friend's house, and then, home. However, most 3-year olds do not typically, or are not allowed to, engage in the same process. Is it possible that such very young children can recognize landmarks in a large-scale terrain, but have limited knowledge of routes, and that adults are aware of this? (Siegal, 1977)

Siegal, in answer to his own question, finds that the available data is sparse; but suggests that the evidence indicates the following sequence:

(1) Initially, the young child notes and remembers *landmarks*: the core of spatial representation is the visual recognition of memory landmarks; and from this core, memory-in-context is derived (e.g. Smothergill, 1973).
(2) Once landmarks are established, the child's acts are registered and assessed with relation to them (e.g. Zaphorzets, 1965): they provide a basis for a *temporal sequence of routes and landmarks* (e.g. Piaget and Inhelder, 1967).
(3) Next, the child forms clusters of landmarks, 'minimaps': internally coherent clusters of elements, which may well lack any correct relationship with other clusters (e.g. Siegal and Schadler, 1977).
(4) The formation of some kind of *objective frame of reference* organizing the separate perspectives into a system in space. [Siegal here cites literature indicating this may have happened by 8 years of age: e.g. Coie *et al.* (1973).]
(5) Full *survey representations* appear only after the establishment both of routes and an objective frame of reference (e.g. Shemyakin, 1972).

It is significant that, although Siegal speculates on the abilities of three-year olds, the literature which he reviews, and bases the above sequence upon, makes the presumption that efficient spatial cognition only develops after about six years of age; and has therefore not bothered to investigate how younger children cope with their world.

Indeed, many of the researchers take what might be called an adulto-morphic view of spatial cognition: how far does the child approximate to an adult's knowledge about structuring of and strategies for using the environment? But, as Rapoport (1976) has argued with relation to cross-cultural differences, there are more ways than one of giving meaning to the world: thus, for example:

> It may well be that the cognitive categories and orientation system used by Australian Aborigines are as valid and *potentially* useful as ours, and their way of defining place

> through purely symbolic and conceptual means may be even more useful: at the very least, it shows the extreme range of place definition of which people are capable.

For one discussion of these aboriginal systems, and the high accuracy of orientation they facilitate [see Lewis (1976)]. The investigator working with very young children needs to be as sensitive as the anthropologist to the possibility that other 'cultures' have their own systems for cognizing the environment. Moore (1979), in a major review of the environmental cognition literature, found the role of cultural variables to be 'grossly understudied'; and we would wish to extend his observation to cover the ontogenesis of spatial cognition.

What Studies are Needed?

What are needed are techniques of investigation which are appropriate to the interests and real-life activities of young children. Furthermore, to look at the *potential* of younger children, as opposed to their average achievements, we suggest that some attention be given to those groups of young children whose local spatial exploration has been extensive, and not hedged in by adult constraints. (The writers have in mind, for example, children living in village communities, or the populations of young children who live in and move freely around certain pedestrianized housing areas in cities.) Another way of investigating potential is to explore the local environment in as far as it is known to the child and systematically extend it by taking him on trips to novel places or using unfamiliar routes, in order to study the child's expanding environmental knowledge. (Our own current investigations with three- to five-year olds, to be reported in future papers, indicate the fruitfulness of such techniques, and support our conviction that average children of this age can quickly learn and describe novel routes, can construct maps of familiar and newly learned areas, and are eccentrically observant of the city, whether directly experienced or presented as a filmed walk through the city.)

It is the argument of the present paper that young children have been underestimated in their cognitive abilities—or potentialities—with relation to the environment both by developmental psychologists and by educationalists (e.g. Satterly, 1964; D.E.S., 1978; but also see Catling, 1979). Such underestimation, we have argued, stems partly from the theoretical perspectives some investigators have brought to their experiments; and partly from the modes of investigation used. Although laboratory-based experiments may be attractive because they are apparently more rigorous, we feel that the sheer convenience of the laboratory has also been a factor in its prevalance in the literature. Compare the time investment required to put a score of children through an experimental task with that which would be needed to record and analyse the same group of children's analogous natural exploration and use of their local environment. One of the classic books of the ecological psychology tradition (Barker and Wright, 1966), comprises the meticulously detailed and interpreted account of the activities of one eight-year old boy in one day of his life: and took several years to analyse and write-up. Whilst we are not arguing that the ecological psychologists' *methodology* would be appropriate for the kind of *cognitive* environmental psychology of children advocated, we are suggesting that their degree of concern and awareness of the child's naturally occurring behaviour should be its starting point. Such observations, akin to the species descriptions of early ethology,

would then generate hypotheses about process which could be tested in the everyday environment by carefully contrived experiments, akin to the modifications Tinbergen (1951) wrought in the natural habitat of his studied species.

Which groups of children would provide the best subjects for such a programme of research? As already indicated, within any particular age group, one should expect a wide variation to exist in the amount and nature of environmental experience gained: indeed, such variety might well form the basis of a series of experimental comparisons. Not only do young children vary considerably in the amount of freedom to explore accorded them by parents; but also one must consider the variety of 'habitats' that they could potentially experience. Some, like Goodman (1961), feel that the modern city child effectively inhabits an impoverished environment:

> The city, under inevitable modern conditions, can no longer be dealt with practically by children, because concealed technology, family mobility, loss of the country, loss of neighbourhood tradition, and eating up of the play space have taken away the real environment.

Against this point of view, one can set the powerful essay by Ward (1977) which argues that the city as experienced is not such an inhuman or impoverished place for children. Nonetheless, Ward does admit that most city children have considerably less freedom—and thus potential for environmental learning—than have the children from smaller communities. The recent cross-national studies by Lynch *et al.* (1977) on adolescents growing up in cities also point to the same conclusion.

Thus, we have argued that to study the *potential* of young children to learn and structure their environment, and to navigate successfully through it, studies should include populations of children who have considerable freedom and range extensively around their locality.

In this respect, Hart (1979) chose well when he selected the younger children of a small New England community, 'Innavale', to study children's natural experience of place. In contrast to the laboratory studies cited earlier, in which each child typically spends a matter of minutes with a strange experimenter performing an unusual task, Hart spent two years in day to day contact with his subjects, in child-guided field trips around the children's usual range: a kind of tracking, in which the investigator enters into close collusion with the child as he goes about his daily play, errands and other journeys throughout the town and surrounding country. A study such as this indicates the great extent to which children, following their own concerns, become environmental experts, developing very effective mental maps of their area, and an accompanying sub-cultural (and often personal) account and evaluation of the various 'places' scattered throughout the area. His natural history of the children's spatial behaviour indicates that young children are highly selective users of neighbourhood space, some areas being practically unvisited by any children, others being their own private places, and the focus of much activity.

Hart argues that when children develop their ranges, what in essence they do is to find or make a series of places, and connect them with a network of pathways, some of almost a ritual nature in their importance to children. (Even quite a small modification can serve to create a 'place' for children, although Hart notes that the younger children tended to use found rather than created places.)

Even in such a community, the investigator quickly notes that the child's home range is one delimited by parental controls (although Hart also notes the regular trans-

gressions of these limits made, especially by the boys in his sample, which are tacitly acknowledged by children and parents alike). Nonetheless, we argue that in such a setting, the cognitive environmental psychologist is much more likely to appreciate the potential of the young child in comprehending and using his environment than he is in his laboratory.

What is of importance to the child may well, as Hart's study shows, include aspects which are simply not reproducible in the laboratory: for example, the importance of natural objects to the child. One other study which has illustrated this point is by Moore (1973), who investigated the elements of place significant to children; asked his subjects to map or draw 'all your favourite places'; and categorized their responses in terms of frequency of mention. Homesite was, not unexpectedly, the most frequently mentioned, followed by references to people and to vegetation, with particular pathways receiving many mentions. Altogether, natural features accounted for just over a quarter of the aggregate rate of mentions.

Young children, because they lack the verbal and graphical skills that are relied upon in many cognitive environmental psychology investigations, tend to be an understudied and, worse, an underestimated population. Yet, as the present paper has argued, competence in handling and using environmental information does not suddenly emerge in those years of middle childhood which many investigators have found easiest to concentrate upon: the young child, either from surrogates such as toy play or from direct experience with the environment, is developing a useful but often very personal and idiosyncratic set of schema for handling further information about the environment. As Neisser observed (1976) the young child has developed much environmental competence long before he can give an account of where he has been or how he gets there; and it is up to us to discover ways in which he can manifest his skills and the processes underlying them.

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Manuscript received: 1 October 1980
Revised manuscript received: 10 December 1980

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DIFFERENCES IN THE PERCEPTION OF NATIONAL SOCIALIST AND CLASSICIST ARCHITECTURE

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Abstract

Eighteen matched facades, nine each of National Socialist and classicist buildings, were rated on 20 scales by 88 German and 61 French-speaking Swiss architects and non-architects (all university students). *Q*-Factor analysis shows one main factor which could be called 'Nazi versus classicist style'. *R*-factor analysis isolated three factors: (1) 'simplicity and uniformity', (2) 'brutality and intimidation', (3) 'heaviness and eternity'. Analysis of variance proves that the predominant source of variance is style. The data indicate that Nazi buildings create quite different impressions from their model, the classicist style. Thus, Nazi style must be regarded as a style of its own, closely related to Nazi ideology. It is assumed that ideology is expressed in architecture by means of metaphorical exemplification.

Introduction

A considerable amount of work has been conducted on the connotation of architectural styles (cf. Krampen, 1979*a*, for summary). However, there has been no empirical study on German Nazi architecture. Nazi architecture is particularly interesting because of its close and obvious relationship to Nazi ideology. During the Third Reich, architecture was consciously employed as a means of propagating Nazi ideas (Hellack, 1960; Miller Lane, 1968; Weber, 1969; Taylor, 1974; Thies, 1976; Arndt, 1979; Koch, 1979; Lasson, 1979).

Hitler, himself 'a frustrated artist–architect' (Taylor, 1974, p. 15), was extremely interested in using the arts and especially architecture for his political purposes. 'I am convinced,' he said, 'that art, since it forms the most uncorrupted, the most immediate reflection of the people's soul, exercises unconsciously by far the greatest influence upon the masses of the people' (Domarus, 1965, p. 528). Because of its supposed psychological power, architecture was seen to be 'the world in stone', as Hitler put it (Domarus, 1965, p. 778), and 'ideology become stone' as 'political confession', as other Nazi art historians and architects have put it (Taylor, 1974, p. 82).

What was official Nazi architecture intended to look like? One of the leading ideologists on architecture wrote: 'The simplicity and straightforwardness of this (Nazi) ideology requires simple and straightforward architectural expression. The marked rhythm of the marching columns corresponds to a marked order in plan

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The study reported here is one of a series dealing with the formal properties of architecture as cues for the differentiation of style. In the course of this series additional sources of variance such as education and concern with housing needs were equally tested. Finally, architecture as a means of metaphorical communication is investigated. The series was directed by Martin Krampen, who also summarized the studies (Krampen, 1979*b*). The author is also indebted to Irka and Roland Beltrami from the University of Geneva for collecting data in Switzerland.

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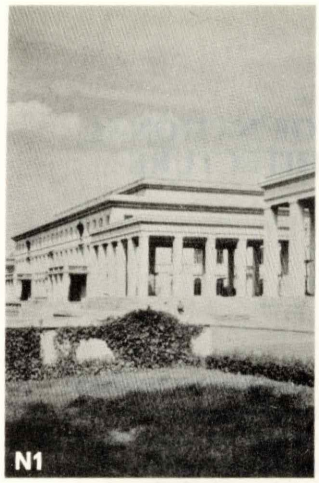
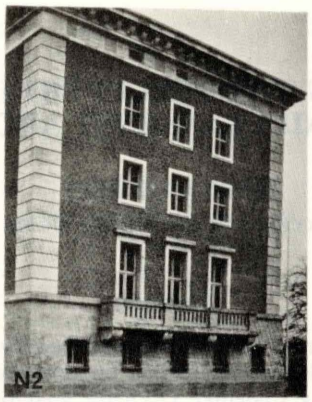
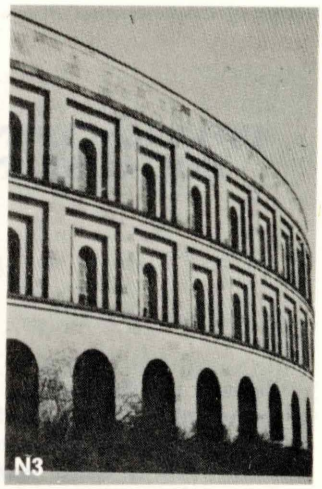
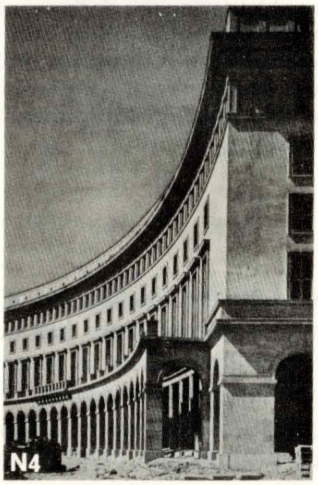
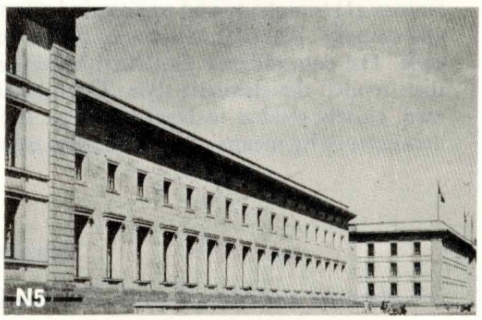
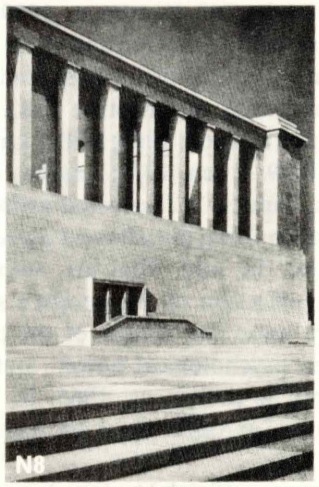


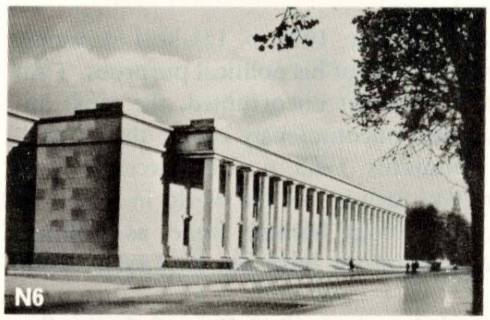


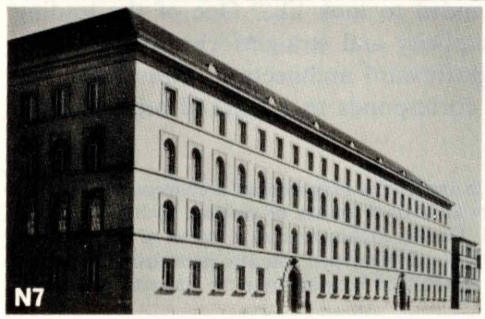


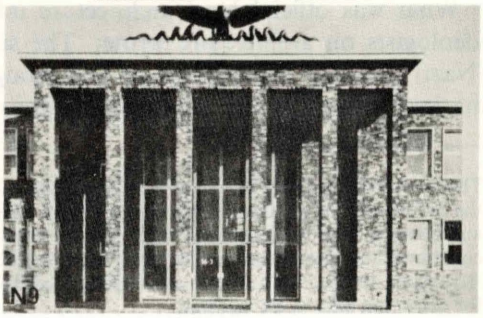




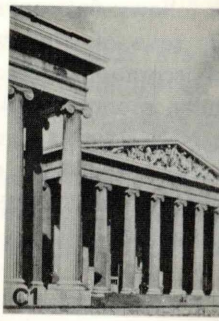


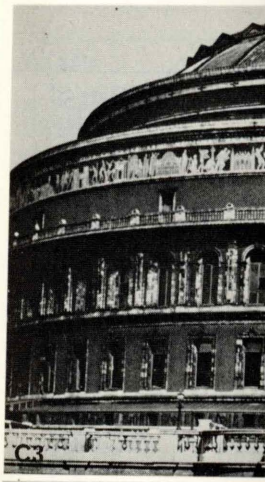


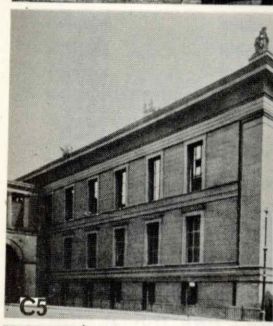


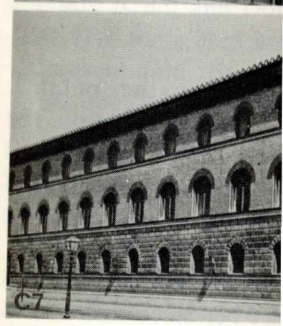


FIGURES N1–N9









FIGURES C1–C9

and elevation of the buildings ... the measure of the individual is given up to the measure of the (marching) formations.' (Stephan, 1939, p. 10).

Arndt and Döhl (1958) describe official Nazi architecture as follows: flat-roofed, horizontally extended, mirror-symmetrical, featuring uniform rows of windows, massive stone blocks, powerful bases and socles, and absence of decoration. By these means, they maintain, an impression of simplicity, uniformity, monumentality, solidity and eternity is created. Thus they characterize the Nazi style as 'Neo-Classicism of a certain hardness' (Arndt and Döhl, 1958, p. 9). Taylor (1974, pp. 44, 150), similarly calls it a 'monumental and simplified Neo-classicism'. Speer himself (1975, p. 617), Hitler's chief architect, defines it as a 'forced Classicism'.

TABLE 1
List of facades

Index	Architect(s)	Building	Location	Date of construction
N1	Troost	Ehrentempel, Führerbau	Munich	NS
N2	Klaje	Barracks	Berlin	NS
N3	Ruff & Ruff	Kongresshalle	Nuremberg	NS
N4	Röttcher & Dierksmeier	Haus des Fremden-verkehrs	Berlin	NS
N5	Speer	Neue Reichskanzlei	Berlin	NS
N6	Troost	Haus der Kunst	Munich	NS
N7	Gablonsky	Landesministerium	Munich	NS
N8	Speer	Zeppelinfeld	Nuremberg	NS
N9	Rimpl	Heinkelwerke	Oranienburg	NS*
C1	Smirke	British Museum	London	1847
C2	Gentz	Prinzessinnen-Palais	Berlin	1811
C3	Fowe & Scott	Albert Hall	London	1871
C4	Nash	Regents Park	London	1812
C5	Schinkel	Altes Museum	Berlin	1828
C6	Baltard	Palais de la Justice	Lyon	1842
C7	Gärtner	Staatsbibliothek	Munich	1840
C8	Perrault	Louvre	Paris	1670
C9	Behrens	German Embassy	St. Petersburg	1912

* NS = National Socialist period.

The relationship between the official Nazi style and Classicism is thus indisputable. However, one may ask to what extent the two styles differ. A relevant question, for Speer still seems to assert that National Socialist architecture is simply neoclassical in style, and is related to any fascist, authoritarian political system only in function (Speer, 1979; Reif, 1979), while others criticize it 'as a means of expressing a reactionary concept of art, culture and society' (Larsson, 1979, p. 175).

The aim of the study, then, is to find out how official Nazi architecture is evaluated and assessed, and to determine empirically whether there are perceived differences between Nazi and classicist styles.

Method

Facades

For this study 18 facades were selected, nine each from National Socialist and classicist public buildings (see Table 1, list of facades and Figures N1 to N9 and Figures C1 to C9). In every case an attempt was made to pair buildings of similar structure and function. Each facade was projected as a black and white slide for about two minutes. The 18 slides were presented in random order to inhibit any easy categorization of the buildings. Furthermore, no information pertaining to the aims of the study was given beforehand, i.e. no mention of comparison between different styles was made.

TABLE 2
List of scales

Variable	German	French	English
01 massiv	– schlank	massive – élancée	massive – slender
02 monoton	– abwechslungsreich	monotone – variée	monotonous – varied
03 nackt	– geschmückt	dénudée – garnie	stark – decorated
04 karg	– üppig	pauvre – exubérante	impoverished – exuberant
05 angsteinflößend	– beruhigend	angoissante – apaisante	frightening – calming
06 straff	– entspannt	tendue – décontractée	tense – relaxed
07 statisch	– dynamisch	statique – dynamique	static – dynamic
08 starr	– belebt	figée – animée	rigid – vital
09 einfach	– kompliziert	simple – compliquée	simple – complicated
10 steif	– geschmeidig	rigide – souple	stiff – supple
11 uniform	– mannigfaltig	uniform – diverse	uniform – diverse
12 hart	– weich	dure – douce	hard – soft
13 ewig	– vergänglich	éternelle – éphémère	eternal – temporary
14 kalt	– warm	froide – chaude	cold – warm
15 scharfkantig	– nuanciert	tranchée – nuancée	sharp-cornered – delicate
16 eckig	– rund	anguleuse – arrondie	cornered – round
17 schwer	– leicht	lourde – légère	heavy – light
18 brutal	– sensibel	brutale – sensible	brutal – sensitive
19 klotzig	– feinteilig	grossière – subtile	crude – subtle
20 einschüchternd	– vertrauenerweckend	intimidante – rassurante	intimidating – reassuring

Scales

A format akin to the semantic differential (cf. Osgood, Suci and Tannenbaum, 1957; Bergler, 1975) was employed, consisting of 20 six-point scales. The adjectives used were taken from the writings of architectural theorists describing Nazi architecture (mainly Arndt and Döhl, 1958). Many of them had a metaphorical character (the adjective pairs used are presented in Table 2). To counter the effect of the order of presentation, the scales were reversed on every second questionnaire. Furthermore, three open questions were asked about each building: its function, date of construction and country of location.

Sample

To increase the validity of such a study it is best to question as varied a sample as possible. The nationality of the subjects could easily have an influence on the results of a study on Nazi architecture. To establish a control, both German (G) and non-German (i.e. French-speaking Swiss) (S) subjects were questioned. To determine

the influence of specialized training both architects (A) and non-architects (N-A) were employed. One hundred and forty-nine subjects, all university students, took part. The structure of the sample is: G A (37), G N-A (51), S A (31) and S N-A (30).

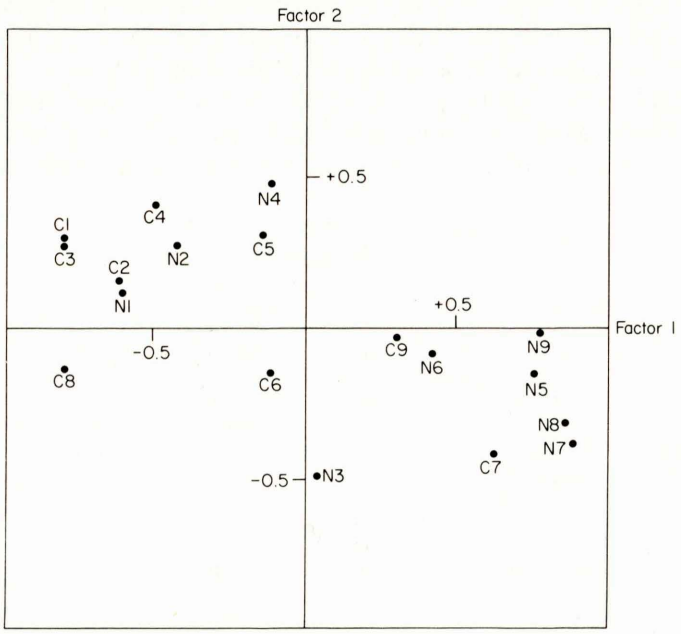


FIGURE 1. *Q*-factor analysis of facades. N1 to N9 = Nazi facades; C1 to C9 = classicist facades.

Results

First, *Q*-factor analysis was used to answer three questions: (1) are the two styles perceived differently, as hypothesized?, (2) which facades are considered most representative of each style?, and (3) do all the facades correspond to their style? The method chosen was the one proposed by Orlik (1965, 1967) which uses the balanced sums of the cross products instead of the correlations. The results show one main factor which accounts for 74·3% of the total variance, and a second factor which accounts for another 10%.

The two factors form a semantic space which is given in Figure 1. All 18 buildings can be plotted in terms of the factor loadings. The majority of the facades occur towards the respective poles of horizontal factor 1. Most of the classicist facades are situated on the left hand side, whereas most of the Nazi facades are to be found on the right-hand side. Factor 1 could therefore be entitled 'Nazi versus classicist style'.

Facades N7 (Gablonsky: Landesministerium, Munich) and N8 (Speer: Zeppelinfeld, Nuremberg) are judged most representative of Nazi architecture, followed by facades N5 (Speer: Neue Reichskanzlei, Berlin) and N9 (Rimpl: Heinkelwerke, Oranienburg).

The most representative classicist facades are C1 (Smirke: British Museum, London 1871), and C8 (Perrault: Louvre, Paris 1670). C2 (Gentz: Prinzessinnen-Palais, Berlin 1811), and C4 (Nash: Regents Park, London 1812) follow.

However there are some 'outliers'. C9 (Behrens: German Embassy, St Petersburg 1912) and C7 (Gärtner: Staatsbibliothek, Munich 1840) are situated near their Nazi counterparts N7 and N9. This is also true for facades N1 (Troost: Ehrentempel and Führerbau, Munich), N2 (Klaje: Barracks, Berlin), and N4 (Röttcher and Dierksmeier: Haus des Fremdenverkehrs, Berlin) which are situated near their classicist counterparts. In all these cases elements of the other style seem to be stronger, and determine the position of the facade in the semantic space.

The vertical factor 2 is characterized mainly by N3 (Ruff and Ruff: Kongresshalle, Nuremberg). This facade was presented first and was mostly seen as an ancient arena. In general, the results show that in spite of some outliers the subjects differentiated between Nazi and classicist styles.

In order to analyse the data in greater depth, the 20 scales used were condensed by *R*-factor analysis. Three factors were obtained.

Factor 1 accounts for 49% of the variance, and factors 2 and 3 account for 7 and 5% respectively. A varimax rotation was carried out on these 3 factors with the following results:

Factor 1: Simplicity and Uniformity

simple	–	complicated	0·79
stark	–	decorated	0·76
impoverished	–	exuberant	0·74
uniform	–	diverse	0·68
monotonous	–	varied	0·65
sharp-cornered	–	delicate	0·59
static	–	dynamic	0·56
stiff	–	supple	0·52
cornered	–	round	0·52
rigid	–	vital	0·50

Factor 2: Brutality and Intimidation

intimidating	–	reassuring	0·76
brutal	–	sensitive	0·73
frightening	–	calming	0·72
cold	–	warm	0·63
crude	–	subtle	0·64
hard	–	soft	0·64
tense	–	relaxed	0·54

Factor 3: Heaviness and Eternity

eternal	–	temporary	0·76
heavy	–	light	0·64
massive	–	slender	0·63

The results indicate that the cognitive structure of the connotative judgements is in accordance with the theoretical assumptions and that 'simplicity versus complexity' is the main criterion in evaluating the styles.

To examine differences between styles and subsamples, analyses of variance with repeated measurements were computed, using factor scores of the *R*-factor analysis above.

TABLE 3
Analyses of variance

Source	F	$p(F)$
(a) Factor 1: simplicity-uniformity		
Nationality	9·54	$0{\cdot}002^{++}$
Education	0·49	0·485
Nationality *x* education	4·44	0·037
Style	525·64	$0{\cdot}001^{+++}$
Style *x* nationality	4·53	$0{\cdot}035^{+}$
Style *x* education	6·17	$0{\cdot}014^{+}$
Style *x* nationality *x* education	2·13	0·146
(b) Factor 2: brutality-intimidation		
Nationality	2·74	0·100
Education	0·01	0·896
Nationality *x* education	1·09	0·298
Style	19·49	$0{\cdot}001^{+++}$
Style *x* nationality	22·79	$0{\cdot}001^{+++}$
Style *x* education	0·01	0·904
Style *x* nationality *x* education	1·51	0·220
(c) Factor 3: heaviness-eternity		
Nationality	17·79	$0{\cdot}001^{+++}$
Education	0·24	0·623
Nationality *x* education	0·00	0·925
Style	6·54	$0{\cdot}012^{+}$
Style *x* nationality	0·23	0·632
Style *x* education	0·93	0·338
Style *x* nationality *x* education	0·00	0·923

The predominant source of variance is style (cf. Table 3). The Nazi style is rated significantly higher in simplicity, uniformity, brutality, intimidation, heaviness, eternity, etc., than is the classicist style. This result would also seem to confirm that there does indeed exist a clear distinction between Nazi architecture and Classicism *per se*.

An unexpected result is the influence of nationality on the evaluation of facades: the German subjects rate both Nazi and classicist styles higher on factor 3, heaviness and eternity, whereas the Swiss subjects evaluate all facades higher on factor 1, simplicity and uniformity. This indicates very definite cultural differences in evaluating facades regardless of style. These differences may be due to the fact that German students are less familiar with older buildings than are their Swiss counterparts, and therefore rate the buildings shown higher on heaviness and eternity. The greater emphasis on simplicity and uniformity seen in the Swiss sample may derive from the same cause: young Germans may be more used to modern buildings, which are in general simple and uniform; therefore they may have considered all the buildings presented to be more complex and varied than the Swiss did. The educational background factor (architects versus non-architects) has no effect on the evaluation of all facades.

One highly significant interaction can be found: in the case of factor 2, brutality and intimidation, the Swiss do not differentiate as much between the two styles as do the Germans. This reflects the fact that the Swiss are less likely to recognize Nazi

facades than are the Germans, and thus use other criteria in evaluating the facades.

Other less significant differences created by the interaction of nationality and style are: for factor 1, simplicity and uniformity, the Swiss rate both styles somewhat higher than the German. For factor 3, heaviness and eternity, the Swiss distinguish between the styles more and, in fact, rate the classical style less heavy and less eternal.

This interaction education x style does not affect the other factors.

Non-architects tend to rate Nazi facades as simpler and more uniform and classicist facades more complicated and decorated than architects do; architects tend to give less extreme assessments on both styles.

Discussion

The results of these investigations indicate that, forty years after their construction, Nazi buildings still impress people in the way intended. The impression the official Nazi style creates is quite different from its model—the classicist style. Thus it has to be regarded as a style of its own, which seems closely related to Nazi ideology. This raises the question of how ideology is expressed by means of architecture. Krampen (1979*b*), referring to Goodman (1969), maintains that it is done by means of metaphorical exemplification. He assumes that metaphorical operations work not only within a medium but also between the media, e.g. from the verbal to painting or architecture. Simplicity is expressed by absence of decoration, uniformity by repetition of windows and forms, intimidation and brutality by exaggeration of dimension, solidity and eternity by heavy bases, socles and building blocks.

'Stones never lie' wrote a Nazi architect (cf. Taylor, 1974, p. 82). It seems this was right at least as far as Nazi architecture is concerned.

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Manuscript received: 5 November 1980
Revised manuscript received: 19 January 1981

Journal of Environmental

NOISE IN THE

DYLAN M. JONES, A

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Journal of Environmental Psychology (1981) **1**, 43–59

NOISE IN THE ENVIRONMENT: A SOCIAL PERSPECTIVE

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Abstract

This is a review of findings relating to the social effects of loud noise. Evidence is drawn from four areas of research: noise annoyance, mental health, social behaviour and performance. It is suggested that noise may bring about strategic changes in behaviour by masking speech and acoustic variation and by its action as a stressor. Based on a range of evidence from laboratory and naturalistic settings three factors are isolated which form a basis for a comprehensive theory of the social effects of noise: (a) social interaction is disrupted by the masking of sounds; (b) the weighting of interpersonal judgements is changed; and (c) noisy settings are perceived as aversive, which governs the utility of social engagement.

Introduction

In a number of settings, most notably those associated with shop-floor factory conditions, individuals are required to work for long periods while exposed to intense noise which may be continuous, intermittent or impulsive. The evidence concerning the auditory effects of this type of exposure is largely unequivocal in showing that industrial noise can lead to hearing loss (for a review see Davies and Jones, 1981). Much of this research has been designed to provide government agencies with guidelines for damage-risk criteria by which to assess acceptable levels of noise exposure. (See for example, Hay, 1975.)

Most research on the psychological effects of working in noise has concentrated on assessing the deleterious effects of loud noise on task performance. These effects of noise have been well documented and recently Broadbent has summarized the harmful effects of noise on task performance, as follows:

> (1) '... a drop in the detection of visual signals that are being reported with risky criteria of judgement.' (2) '... an increase in the number of instants of inefficiency, resulting in errors or (in some cases) occasional slow responses.' (3) '... concentration on some parts of a complex display at the expense of others.' (1978, p. 1052).

Work on performance effects represents almost the sum total of research into the psychological response of persons who are exposed to noise in occupational settings. This narrow focus is unfortunate because recently evidence has come to light that occupational stressors, of which noise counts as a major one, not only affect individuals' physical health and job performance but that they also affect the quality

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of social life. Meissner (1971), for instance, has provided evidence which indicates that workers who engage in socially isolating jobs take part less in leisure-time activities which require extended social interaction. Jones and Chapman (1979) reviewed studies in this area and concluded that occupational stressors can have profound negative 'spill-over' effects on a person's use of his leisure time. Indirect evidence of this kind suggests that the traditionally recognized properties of noise should be extended to include noise as having deleterious social consequences.

This paper primarily concerns the effects that noise has on a person's management of action within the social environment. The person is seen as an agent; not a passive respondent to environmental stimuli, but one who acts to create change in the environment through the construction of goals and the performance of intentional behaviour. We suggest that noise can interfere with various conscious and unconscious intentions either by virtue of its physical properties (for example, as a masker of speech) or psychological properties (for example, as an environmental stressor). The manner in which this interference is manifested is by the adoption of one of a variety of behavioural strategies. Workers in the field of human performance have recently adopted this viewpoint (for example, Rabbitt, 1979; Broadbent, 1981), but this suggestion has not previously been made explicit in terms of the social effects of noise.

We are concerned to describe the effects of noise within the social context and to identify the properties of noisy environments which precipitate these effects. Because the literature which pertains to social effects of working in noise is sparse, we have drawn upon a variety of sources of evidence and we outline some of the more important effects. At the same time attention is drawn to some pertinent environmental contingencies of these effects.

Noise and Annoyance

Subjective reactions of annoyance are widely documented effects in those who live or work in noisy environments. However, although these may be useful in the formulation of policy, they are rather uninformative from a psychological perspective. Consequently, attempts have been made to locate reactions of annoyance within the context of other psychological responses. This has given rise to two general lines of inquiry. First, there are those studies which have explored the attitudes and beliefs of those individuals who claim to be annoyed. Second, there are those studies which have sought to relate feelings of annoyance to the possession of distinctive personality traits (for example, Griffiths and Delauzun, 1977).

(i) *Attitudes and beliefs*

Weinstein (1976) summarizes research showing, for instance, that degree of annoyance relates to beliefs about noise as a health risk and beliefs about the purpose of the noise source. A number of studies has shown that altering attitudes toward the source of noise can significantly relieve community reactions. Sorensen (1970), for example, examined the effect of distributing a number of pamphlets informing residents living near a Swedish Air Force base about the function of flights, and found that mean levels of noise annoyance were significantly reduced as a result of the propaganda.

(ii) *Personality traits*

The second line of inquiry has shown that despite a high and positive correlation between site noise-levels and *mean* ratings of annoyance at those sites, noise level alone correlates at a much lower level with *individual* scores of annoyance or dissatisfaction. This finding has prompted the proposal that individual differences are a more potent variable mediating response to noise than is the level of noise *per se*. The most commonly suggested trait which differentiates between people is that of sensitivity to noise. Bryan and Tempest (1973) put forward the notion that annoyance responses are distributed bi-modally rather than normally. Thus the upper mode of the bi-modal distribution contains a significant minority of noise sensitive respondents. By including scores on a self-rating scale of sensitivity to noise in the relation between noise and annoyance, a number of studies has found that the amount of variance between individuals accounted for by noise can be significantly increased. Langdon (1976*a*, *b*, *c*) subdivided his respondents into three sub-populations; noise-sensitive, neutral and non-sensitive. He found that allowing for individual differences in self-rated sensitivity had no effect on grouped data but for individual responses it raised the amount of variance accounted for from 4 to 20%.

Weinstein (1978), on the basis of questionnaire responses obtained before students arrived on a campus, distinguished two groups of respondents, one sensitive to noise, the other insensitive. The major focus of his study was the students' adaptation to dormitory noise during their year-long sojourn in the college. As expected, noise-sensitive students were much more bothered by dormitory noise, and they became increasingly disturbed during the year, while the noise-insensitive students showed no change in disturbance. In the second part of the study, with a larger sample of students, sensitivity scores and scores from a range of personality tests were examined. Correlations between sensitivity scores and dimensions of the California Psychological Inventory revealed noise-sensitive subjects to be generally lower in dominance, capacity for status, sociability and social presence. This portrayal of the socially-withdrawn, noise-sensitive individual was further reinforced by a negative correlation between noise sensitivity and extraversion.

The interpersonal significance of dormitory noise may lend special poignancy to the association between sensitivity and sociability. Weinstein's scales of noise sensitivity emphasized the action of other persons and their responsibility for producing noise. An emphasis on the action of others raises the question as to whether the various measures of sensitivity to noise are tapping a sociability factor. Future studies would profit from focusing on the various possible sub-types of noise-sensitivity and their relation to personality variables.

Several studies have implicated extroversion as a factor mediating noise annoyance. In descriptive terms extroversion can be regarded as a dimension reflecting the sociability and 'out-goingness' of individuals and it is thus of particular interest in the present context. The major *intervening* variable accounting for individual differences in extroversion has been the tonic level of cortical excitation. Extroverts tend to have higher sensory thresholds (for example, Smith, 1968) and show greater intolerance of sensory deprivation (for example, Petrie *et al.*, 1960); and, because of their chronically lower level of cortical excitation, extroverts tolerate and seek greater sensory stimulation.

The number of studies examining the association between extroversion as measured

by the Eysenck Personality Inventory (EPI) and annoyance produced by actual sounds is small and the evidence equivocal. Anderson and Robinson (1972) found a significant relationship between annoyance to specific sounds and extroversion in a group of twenty-four housewives. Overall, they found extroverts to be more noise-annoyed than introverts, but a detailed breakdown of their data showed that this trend was due to a more pronounced increase in extroverts' annoyance over four test sessions together with a more modest decrease in introverts' ratings over the same period. It may be that extroverts adopt the strategy of optimizing sensory *change* (cf. Gale, 1969), a suggestion which echoes that of Davies *et al.* (1969) who showed that extroverts choose to receive more periods of varied noise during a task than do introverts.

Laboratory studies of performance have, however, generally supported the view that extroverts prefer, or tolerate, higher *levels* of noise than introverts. For example, Davies and Hockey (1966) found loud white-noise improved the performance of extroverts in a vigilance task, while introverts were superior under conditions of quiet. When given discretion over the level at which a noise may be set during the execution of a task, extroverts set higher levels than do introverts (Hockey, 1972). This result appears to apply for children as well as adults: extroverted children apparently tolerate a much higher level of white noise than do their introverted counterparts (Elliott, 1971).

The two lines of inquiry just outlined tell us about social behaviour only indirectly. Although attitudes form a basis for social behaviour they do not predict with any precision the form that behaviour will take. The investigation of personality traits can be criticized on the same grounds. Indeed, one systematic large-scale study has cast serious doubt on the efficacy of this latter approach. Griffiths and Delauzun (1977) attempted to test a number of methodological issues which underpin many noise annoyance surveys. Primary amongst these issues is the reliability of noise annoyance and sensitivity scales. A second issue was concerned with the bi-modality of the annoyance distribution. A third issue focused upon the association between annoyance/sensitivity and personality traits. Their study took the form of a repeated interview-survey. Reliabilities of a scale of 'dissatisfaction-with-noise' scale and two sensitivity scales (the Broadbent/Gregory Scale and a seven-point self-rating scale) were examined in the first two interviews. In a third interview respondents completed an EPI and the Cattell 16 PF personality questionnaires. It was found that: (a) the annoyance distribution closely approximates normality with no evidence of bimodality; (b) both the dissatisfaction-with-noise scale and the self-rating scale of sensitivity had low but significant reliability co-efficients; (c) no dimension on either the EPI or the 16 PF was related to noise dissatisfaction or sensitivity; and (d) *within* noisy site zones the self-rating sensitivity scale correlated significantly with dissatisfaction. However this latter relationship is considerably weakened by the sensitivity scale's low reliability. They conclude by saying that:

> '... most of the variation in noise dissatisfaction is not related to *detectable* individual differences but to randomness in response to the measuring instrument, and that the influence of noise sensitivity on dissatisfaction is small' (p. 106).

The Griffiths and Delauzun study does not however preclude the possibility of finding personality traits associated with noise annoyance under different circumstances. Of the four sites they chose for study (two 'noisy' and two 'quiet') all the 25 subjects to whom personality tests were administered were selected from noisy

sites. It seems that personality-trait differences play a more decisive role in mediating extreme annoyance responses to modestly noisy environments rather than to very noisy environments. Most individuals, regardless of their personality, may already be annoyed when exposed to a very noisy setting. François (1976) found neurotic people more sensitive to noise at low exposure levels, but not at high.

Generally, the continued quest for stable, endogenous personality traits in determining an individual's responses to noise is impeded by two considerations. First, the balance of empirical evidence fails to justify it. Second, (Mischel (1969) and others in the field of personality and social behaviour have argued that the setting, or more specifically the individual's interpretation of the setting, is a more reliable predictor of behaviour than personality traits. This accords well with the view set out earlier that noise interferes with ongoing plans and intentional behaviour. We may thus view observable changes in behaviour wrought by noise as adaptive, goal-directed strategies.

Noise and Mental Health

Whether in contexts where noise is a relatively permanent feature the above mentioned changes in strategy have repercussions on mental health is a point open to question (see Jones *et al.*, 1979, for an overview). In one study Abey-Wickrama *et al.* (1969) found a significant positive relationship between rate of admission to psychiatric hospital and aircraft noise. The methodological basis of this study has been questioned by a subsequent re-examination of the data by Jenkins *et al.* (1979). It seems likely that noise *sensitivity* may be a factor associated with a predisposition for mental illness but that noise exposure *per se* may play only a minor role in the causal chain culminating in mental illness (Tarnopolsky *et al.*, 1978).

Several lines of indirect evidence point to some increase in incidence of minor psychiatric disturbance as a result of exposure to noise. For instance Cohen *et al.* (1978) have pointed out that:

> 'Existing evidence suggests that noise may indeed have some responsibility for the personal disorganization of those living or working in noisy environments. Industrial surveys, for example, report that noise exposure results in increased anxiety and stress responses. Workers habitually exposed to high intensity noise show increased incidence of nervous complaints, nausea, headaches, instability, argumentativeness, sexual impotency, changes in general mood and anxiety.... Jansen (1961) reports that workers in the noisiest places in a steel factory have a greater frequency of social conflicts both at home and in the plant.' (pp. 14–15).

Cohen *et al.* (*op cit.*) point out that it is problematic to claim that these effects are due solely to noise. There is a variety of other stresses associated with noisy work places and these too are probably influential. At the very least, however, the evidence is suggestive of distinctive social effects.

Social Behaviour

We now turn to examine social behaviour in particular noisy settings and draw upon research undertaken in naturalistic and experimental settings.

(i) *Studies in naturalistic settings*

Studies under this heading have attempted to document observable changes in behaviour resulting from exposure to everyday sounds. In many cases traffic noise in residential areas has been the focus of inquiry. For example, a study by Appleyard and Lintell (1972) compared the quality of life for residents on three separate streets. The streets were similar in most of their physical attributes; they differed chiefly in respect of traffic flow being respectively 'heavy', 'medium' and 'light'. On the 'heavy' street noise levels were above 65 dB for 45% of the time, for 25% of the time on the 'medium' street, and for only 5% of the time on the 'light' street. One result of the study germane to our concern with social effects was that the social networks on the three streets were vastly different. The residents on the 'light' street had three times as many local friends and twice as many acquaintances as those on the 'heavy' street, with residents of the 'medium' street falling between these two. In some cases the noise on the 'heavy' street was so loud that it seriously disturbed residents' 'normal' routines; for instance, one elderly couple attempted to take extra sleep during the day time. As with industrial surveys, however, it is difficult to attribute these effects to noise alone since there were other differences between the streets which could no doubt have influenced the quality of the residents' social life.

A similar interpretative difficulty rests with a study by Damon (1977). The effects of traffic noise on individuals in a residential development was assessed for those individuals living close to traffic and those who lived in less noisy areas. Despite finding systematic differences between individuals living in noisy and quiet areas (including differences in truancy, care of dwellings, and the number of police arrests) these could be accounted for by other factors such as family size which varied over the areas under study.

(ii) *Field experiments*

Experimental studies have attempted to overcome the major drawback of surveys in the naturalistic setting: that of inadequate control of extraneous variables. They have endeavoured to quantify the effects of noise on various broad social variables such as helping behaviour or social interaction.

Several investigators claim to have shown that noise deleteriously influences the individual's social responsiveness to others as expressed by the nature and degree of help offered to those in distress. In a series of studies, Matthews and Canon (1975) investigated the influence of noise on the willingness to help an experimenter's confederate recover materials which were dropped, apparently by accident. In a laboratory setting subjects exposed to 85 dB noise were less likely to help than those exposed to a maximum of 65 dB. Using comparable manipulations in a field setting they found that a loud motorized lawnmower made subjects less likely to help than when the lawnmower was quiet. Matthews and Canon also examined the perceived need for assistance by comparing the help offered to a confederate with or without a plaster cast on his arm. The presence of the cast increased helping under ambient but not noisy conditions. These findings have generally been regarded as suggesting that noise impinges upon social behaviour by reducing sensitivity to others. Whether noise reduces our apprehension of others' physical presence or needs cannot at present be resolved. The findings of Matthews and Canon would suggest that the latter view is the more plausible since without the plaster cast helping reached a baseline below

which no further reduction could be induced in the presence of loud noise. Another view (for example, Cohen and Spacapan, 1978) is that noise reduces the range of utilization of social cues in a manner analogous to that found in multicomponent tasks (see, for example, Hockey, 1970*a*, *b*) where noise narrows the attentional focus. However several workers have questioned the generality of the effect found in multicomponent tasks (Forster and Grierson, 1978; Loeb and Jones, 1978), the magnitude of the effect depending on subtle changes in the nature of the task (Hockey, 1978; Broadbent, 1981); and this suggests that further generalization to the social setting may be premature.

In a field study, Ward and Suedfeld (1973) attempted to isolate some salient effects which could be directly attributed to noise. They erected speakers outside a classroom and dormitory on a university campus and played a recording of highway noise for twenty-four hours over three days. Changes in students' behaviour and subjective reactions to the noise were recorded. In the classroom there was less participation, less attentiveness, greater difficulty in hearing what was being said and a greater use of lectures than discussion. In the dormitories, those exposed to loud noise reported more adverse changes in sleep, studying, social relations, judgement, alertness and nervousness.

The studies by Matthews and Canon (1975) and Ward and Suedfeld (1975) suggest that noise may be acting in at least three, possibly complementary, ways. First, there may be changes in affective state which are induced by noise acting as a stressor and, second, noise may act to mask speech and thereby weaken our major means of communication. Thus the attentional changes, alluded to above, could arise out of an involuntary focusing of attention, away from social cues, as a result of a noise-induced change in bodily state or arousal. Evidence relating to the latter point comes from a study by Cohen *et al.* (1973) of children living in high-rise housing next to a busy highway. They found that children living in the lower noisier, flats showed poorer auditory discrimination and reading skills than those living in the higher, less noisy flats. However, the masking effects of noise may be responsible for all these changes; that is, noise may mask sounds in the behaviours which are conventionally ascribed to changes in state associated with the *psychological presence* of another person, and hence it may bring about reduction in sociability. Cues to others' presence and activities (like the sound of dropped books in the Matthews and Canon study) may be less marked in conditions of loud noise so that attention may not be drawn to the person in distress. The third possibility is that subjects may simply find noisy settings aversive and pass through them speedily without regard to other persons.

Unfortunately the bulk of the research thus far conducted does not allow us to distinguish between these theoretical possibilities. However evidence that those phenomena normally associated with changes in breadth of attention may in fact arise from an attempt to escape from loud noise comes from a study by Korte and Grant (1980). The study tested the attentional selectivity hypothesis using high and low conditions of traffic noise. A confederate stood on the sidewalk either clad in garish clothes with brightly coloured balloons tied to a nearby tree or clutching a bright, yellow teddy bear near a conspicuous advertisement proclaiming 'Attention—Project in Progress'. Pedestrians who walked past the confederate were then approached by an interviewer who asked them if they had noticed 'anything unusual'. Korte and Grant found that in high traffic noise conditions pedestrians admitted

to noticing the 'unusual' confederate and associated objects less often than in low traffic-noise conditions. However, additional data collected by Korte and Grant showed that in the high traffic-noise site pedestrians walked more quickly through and gazed straight-ahead for longer than in the low traffic-noise site. Naturally the speed with which individuals move through a setting will in large part determine their sampling of the environment. Furthermore, it appears that the majority of the respondents did not find the confederate 'unusual' and they had to be prompted to recall information about the confederate and nearby objects. Therefore, what is usually taken to be an involuntary change in attentional selectivity due to noise, may be a deliberate means of trying to escape the noise; that is, an intentional strategy adopted in the noisy environment combined with a more perfunctory approach to the interview.

Page (1977, Experiment 1) failed to find an effect of noise levels as high as 100 dB on helping behaviour using a natural setting similar to that of Matthews and Canon. A second experiment using a larger sample examined the extent of verbal and physical helping in the presence of loud noise. Again the ploy of object-dropping was used, 'help' being recorded at three levels: the subject picking up the object for the confederate, telling the confederate that the object had been dropped, or no help at all. Curiously, instances of verbal combined with physical help were apparently not recorded. Less of both types of help was given in high (91 dB) noise conditions. Women, but not men, differed in the type of help offered according to noise level: there was no change in non-verbal help between noisy and quiet conditions but women offered markedly less help in loud noise. It is not immediately clear why noise should yield sex differences in helping behaviour.

Korte *et al.* (1975), in a large scale study, found consistent differences in subjects of both sexes in the type of help offered in loud noise. In a naturalistic setting, they assessed helpfulness in the form of granting a street interview or calling attention to a dropped key or offering to direct a lost person. A composite index of environmental input was derived from sound level, traffic and pedestrian counts, and number of buildings. Helpfulness and environmental input were found to be inversely related to the number of interview refusals and offers of help to give directions. It was the number of interview *refusals* which increased in noise rather than the proportion of persons who simply ignored the request; and this is noteworthy in relation to those views invoking attentional focus explanations for the social effects of noise. A similar study by Boles and Hayward (1978) showed that the proportion of subjects willing to grant an interview was significantly lower in both noisy and noisy-dense conditions compared to conditions which were quiet or low in density.

Both Korte *et al.* and Boles and Hayward see their findings as confirming Milgram's (1970) thesis that input overload leads to the adoption of tactics to filter or block some of the inputs which, in turn, lead to interpersonal indifference, antipathy or lack of co-operation. However a strong version of Milgram's argument is not supported by Korte *et al.*'s finding that key-dropping showed no effect of environmental input. Both the behaviours which did show an effect of input involved verbal interaction; and the reluctance to engage in these types of helping may be a function of the perceived difficulty in executing such acts in noisy environments. Clearly some manipulation of environmental input without changing noise levels would serve as a more stringent test for Milgram's view.

(iii) *Social perception*

In one of the few studies investigating noise effects on interpersonal perceptions Siegel and Steele (1980) examined the tendency to form ill-considered judgements of others when environmental distraction is high. Despite the fact that subjects were required to judge individuals from information which was not directly relevant to the dimensions of judgement, distraction in the form of noise (at 70 dB) increased the extremity of such judgements. Siegel and Steele's study makes it clear that noise did not influence the extent of *encoding* of information; that is, subjects in the noisy condition did not take in less information as a result of being distracted. The precise reason for such extreme responses is open to question. Siegel and Steele favour an explanation based on the subjects' *ability* to weigh and integrate the available evidence. Extreme social judgements in loud noise are paralleled by extreme confidence judgements in laboratory studies of human performance; for example those found by Broadbent (1965) for confidence judgements in vigilance tasks (see below). The 'extreme response' phenomenon may, in part, account for the results of a study by Edsell (1976) who found that subjects in loud (75 and 61 dB) as against ambient (51 dB) noise who were engaged in a competitive parlour-game involving the perception of group behaviour, were more 'disagreeable', 'disorganized and inappropriate' and 'threatening'.

In sum there is no single mechanism by which noise influences social behaviour. There are several mechanisms, and any comprehensive theory of noise and social behaviour must incorporate at least the following three factors: (a) masking effects and the concomitant disruption of social interaction; (b) changes in weighting of judgements and particularly in the use of extreme categories of response; and (c) perceived aversiveness of the noisy environment together with the utility of engaging in specific actions. Helping behaviour may be regarded as involving a series of judgements or attributions about the legitimate needs of another and the type of interaction demanded by the context. There is a relative paucity of data concerning these processes. However, distinctions of the sort we have been advocating would be feasible in a study such as that by Korte *et al.* if subjects were invited to express their views on an interviewer who apparently selects a noisy setting for an interview.

Noise and Working Efficiency

A field study by Broadbent and Little (1960) is one of few which have examined the effects of industrial noise over an extended period. The performance of subjects on a production line who loaded cinematic film into a perforating machine was studied, and the effects of noise reduction were found to parallel those in laboratory studies: the rate of work was not improved but errors were less frequent. While the authors state that demand characteristics served to increase 'morale' and improve performance their description of the workplace suggests that other social factors were important in enhancing the noise effects. Social isolation may also have contributed to the performance changes: after acoustic treatment, noise was still high in absolute terms (90 dB) and also the treatment itself involved erecting sound absorbent baffles between the rows of perforating machines. This treatment would have served to further inhibit verbal communication between workers, and the functional noises made by other workers' machines would have been diminished in intensity and salience. Because

workers were effectively isolated they would have been encouraged to establish their own standard of work, and this again is likely to have contributed to the decline in errors.

In recapitulating we can offer the following statements concerning the social effects of noise: (a) there is little evidence that prolonged exposure to noise affects mental health; (b) noise affects mood, increases anxiety and disrupts active participation in the social environment; (c) environmental noise decreases the likelihood of helping behaviour being exhibited, although a number of theoretical issues remain unresolved; and (d) noise may contribute to social isolation.

In the next section we turn to examine the role of noise as a stressor. Rather than examine in detail the various experimental effects (see, for example, Broadbent, 1981) we turn to a general consideration of models which touch upon the social and cognitive aspects of noise experiments.

Noise as a Stressor

We have emphasized the stressful properties of noise in the causal network culminating in negative social effects. For example, in discussing helping behaviour we suggested that a comprehensive theory of social effects would have to include three factors, viz. the masking effect of noise, changes in the weighting of judgements in noise, and the perceived aversiveness of noise. A detailed discussion of the first factor is deferred until the next section. In this section we consider the other two factors and the manner in which they relate to the concept of stress.

As a general concept 'stress' has always posed definitional problems, and for this reason its definition has tended to be paradigm-specific. Perspectives may take a 'life-stress' approach (Dohrenwend, 1978) or one based upon the effects of stress on task performance (Broadbent, 1971). The latter approach to stress research has concentrated upon the effects of short-term exposure to a range of stressors, including noise. The hypothetical construct by which noise and other stressors (for example, heat and loss of sleep) are said to have their effect upon performance is that of a change in state of arousal; and the inverted-U curve is suggested as a model of its action (Broadbent, 1971). Studies on the interaction between stressors have tended to verify this viewpoint (for example, Wilkinson, 1963). Thus deteriorations in performance may be expected from under- or over-arousal. It was in the context of the arousal model that Hockey (1970) conducted his work on attentional selectivity under noisy conditions, finding that subjects in noise concentrated on particular aspects of a subsidiary monitoring task at the expense of others. In recent years, however, the theoretical backdrop to the study of performance under stressful conditions has undergone substantial revision. Rabbitt (1979), for instance, has distinguished passive 'data-driven' or 'bottom-up' models of human information-processing from active, 'resource-driven' or 'top-down' models; and he has proceeded to demonstrate how the latter form a more coherent explanatory basis of human performance under stressful conditions. He characterizes 'resource-driven' models thus:

> '... subjects cannot be considered to simply, passively monitor events ... Their performance can reasonably be interpreted in terms of a model of strategic sampling behaviour, which postulates that they rationally allocate more or less time to inspection of a display depending on the stochastic models which they develop for

task parameters, and their assessment of reward and penalties for noting or missing signals.' (p. 130).

Thus attentional selectivity may be viewed, not simply as a mechanistic response to noise, but as an aspect of an overall strategy formulated by subjects in response to experimental conditions. Hockey (1973), for instance, found that when subjects were exposed to noise they made 'observing responses' more frequently to those sources where signals were more probable. Rabbitt (1978) in reviewing such evidence, comments: '... we can distinguish between subjects' *knowledge* of the respective stochastic probabilities of signals from various sources, and their *use* of the knowledge ... (p. 131) (his emphases). In a similar vein, a series of studies by Broadbent and Gregory (1963, 1965) showed that subjects' confidence ratings as to the presence or not of signals in a visual detection task became more extreme in noise; that is, intermediate judgements of confidence decrease in noise, subjects tending to assert or deny with greater confidence the presence of a signal.

In the context of strategic effects of laboratory stress, two types of model may be distinguished (Jones, 1980). On the one hand strategic effects may arise out of, or as compensation for, changes in the effectiveness of different processes in loud noise. Hockey (1979) advanced a view of this type suggesting that a change in arousal predisposes an individual toward certain kinds of mental activity; for example, to one where storage operations are used less optimally. Moreover, impairment at one stage of processing may be partly overcome by the deployment of compensatory strategies, in a manner analogous to the way rehearsal may be employed in normal conditions to overcome the capacity limitations of short-term storage (Atkinson and Shiffrin, 1979). Models of this sort may be described as possessing an internal frame of reference in that they posit processing deficits which may be partly or wholly countered by a strategic reassignment of processing resources albeit in an involuntary manner. The other possibility is that noise influences the *use* of processing resources. Here, we may refer to an external frame of reference, with strategies essentially arising out of the subject's perception of the demand characteristics (Orne, 1962) of the experimental setting. Strategies, in this perspective, are purposive and goal-directed. It behoves us to suggest the nature of the changes in investment policy which noise may bring about. Noise may, for example, alter the perception of competence at a task: strategies then emanating from an effort to maintain the apparent integrity of performance. A related suggestion from Broadbent (1981) is that noise increases the investment in those activities which produce the greatest return for effort. Clearly noise appears to alter the regulation of performance, and this is governed by factors such as the difficulty of the task or the knowledge of results (Thomas and Jones, 1979). In turn this intepretation suggests that physiological concomitants of performance in loud noise are manifestations of processing effort (Kahneman, 1973).

The idea that coping with noise involves some active cognitive intervention has also evolved in other areas of inquiry. Since the beginning of the nineteen-seventies there has been an increasing amount of interest in the notion of 'perceived control' as a means of alleviating the deleterious after-effects of noise (Glass and Singer, 1972). In a series of studies, subjects exposed to loud intermittent noise over which they had no control did not show detrimental effects in their performance *during* the noise but performed badly when the noise had ceased and they moved to another room. This result contrasted with those from similar groups of subjects who were told that

they could terminate the noise although they were encouraged not to do so: these subjects showed no detrimental after-effects of exposure to noise. Glass and Singer explained this difference by reference to the notion of perceived control; that is, impaired post-noise performance was said to be due to a lack of perceived control over the termination of noise. One critical aspect of this study was likely to have been the subjects' self-perceptions. Under conditions where they were encouraged to tolerate the noise, they were likely to perceive themselves as 'good' subjects and, consequently, they would want to maintain this image of themselves by performing well on the post-noise tasks.

As intimated earlier noise can be characterized as being perceived as an aversive component of a setting; and individuals attempt to control their participation in that setting by adopting certain task-specific strategies. A viewpoint similar to the one outlined here has recently been expressed by Rapoport (1978):

> 'The crucial point, that evaluation and matching of situations against certain desired levels, norms and the like occur (although frequently beyond awareness), and that environmental attributes become stressors on this basis is implicit, but rarely made explicit, and even more rarely given central importance. Thus, if stress may follow from stimulus overload, behavior constraint or resource scarcity, then whether it does will depend on the meaning attached to these variables in particular situations and the evaluative standards used.' (p. 245).

In the occupational setting the influence of noise is due not only to its aversive properties; it also makes social interaction more difficult. We now turn to a consideration of this aspect of noise by reference to its masking properties.

Noise as a Masker of Speech

The masking of speech is a widely documented direct effect of noise. But, in addition to speech, noise also serves to mask all the other incidental components of our normally varied acoustic world. Circumstantial evidence from observational studies of people working in noisy environments suggests that workers attempt to overcome the isolating effects of noise by adopting more nonverbal styles of interaction. Kryter (1970), for example, reports that workers increase their use of gesture, posture and facial expression as a means of communication under noisy conditions. But the pervasiveness and impact of noise-induced difficulties in communication on social and emotional well-being in general, has yet to be established. A study by Meissner (*op. cit.*) suggests that there is a detrimental effect. The workplace, he suggests, is a principal source of skills for the production and maintenance of social activities. When noise prevents normal interaction, these social skills cannot be practised and individuals gradually become less adept in the common skills of social interaction.

Much of the research effort in this area has been directed at establishing those levels of noise and the spectral composition of sounds which are most damaging to the reception of speech. Emphasis has invariably been placed on the intelligibility of communication systems, such as telephone lines, and they are based on the performance of young (usually male), articulate subjects with normal hearing in settings where no face-to-face contact is permitted. The lack of attention to social and situational factors in mediating the production and reception of speech is lamentable. Only recently has there been any systematic attempt to study ameliorative power

of visual cues in overcoming masking of speech by noise. For example, Waltzman and Levitt (1978) reported that face-to-face encounters using visual cues markedly improves the intelligibility of noisy messages. Criteria based on the absence of visual cues were found to overestimate the interfering effect of noise for face-to-face communication by as much as 20 dB (based on Speech Interference Levels; Webster, 1973). Greatest benefit is found with speaker-to-listener distances of below 1·5 m for a given signal-to-noise ratio.

Virtually nothing is known of the skills of perceiving speech in noisy conditions. On the other hand there is ample anecdotal evidence that individuals who are practised at conversing in noisy settings are able to pick out speech with far greater facility than others who are not practised. Experimental evidence indicates that this advantage is not due simply to the use of nonverbal cues but to some skill in the perception of speech (Tobias and Irons, 1973) including the familiarity of the voice (Schubert and Parker, 1955). However, these phenomena await further investigation. Even less is known of the habitual nonverbal cues which are employed to augment the perception of speech in noise. To our knowledge, not one study has investigated the role of gesture either as a primary or subsidiary means of communication in noisy settings.

Ironically, the use of ear-defenders does little to alleviate the problems of perceiving speech that would otherwise be masked by noise. Generally speaking, the speech-to-noise ratio remains the same whether the ear is protected or not. At noise levels between 70 and 85 dB ear defenders offer no *greater* degradation than that for the unprotected ear, but when the noise is temporarily in abeyance ear defenders may attenuate speech to a level below the threshold for audibility (Howell and Martin, 1975; Levin, 1980).

Certainly, a residual psychological cost has to be paid for listening to speech in noise. For example, Rabbitt (1966, 1968) has shown that the effort of trying to understand speech in noise led subjects to forget material previously learned in quiet. The presence of noise itself seems to be a prerequisite for this kind of effect. In terms of intelligibility of speech Broadbent (1958) found that adding noise to speech produced a similar effect to removing those noise-masked frequencies from the signal. However, the presence of noise had a far greater deleterious effect on a secondary tracking task (performed during the intelligibility test) than did the filtered speech. Whether these costs reduce the likelihood that the individual will engage in any verbal discourse is open to investigation. It might be suspected that the incidence of casual conversation might be reduced in such circumstances which may in turn lead to social isolation. Indirect evidence on this point arises from a study by Jones and Broadbent (1979) who examined the after-effects of a proofreading task involving verbal communication. They found that subjects' ratings of mood in the period following exposure to loud noise showed subjects who had been so exposed to be less 'activated' and less 'euphoric' than subjects who had performed the proofreading task in quiet. The group exposed to loud noise also reported less 'social affection' but the effect failed to reach significance.

That the interference with speech by noise has profound social consequences is attested to by ample anecdotal evidence. Direct examination of these consequences by experimental and/or observational methods is lacking. It seems likely that masking has two consequences. First, and most straightforward, noise reduces the quality of the transmitted message with a consequent loss in fidelity and/or in the speed of communication. Second, because of the difficulty in communication, noise increases

the cost of verbal engagement or possibly restricts the nuance and richness of verbal discourse. The fact that some of these effects may be produced when ear-defenders are worn makes their study even more pressing. Empirical evidence is required on several facets of the noise effects reviewed here. At a descriptive level some indication is required of the role of gesture and lip reading in noisy settings. This should be augmented by studies of the type investigating such effects as social isolation and the psychological cost paid for communication.

General Conclusions

Aside from reviewing most of the salient evidence relating noise to social behaviour we have recommended some new directions for research and provided an interpretative framework for these effects. Components of this framework include the action of noise (a) as an aversive stimulus, (b) as a stressor, and (c) as a masker of speech.

The effects of annoyance and irritation are relatively well documented. There is evidence relating personality to expressed annoyance, although a coherent picture fails to emerge because of a number of methodological and interpretative impediments. There are tentative indications that extroversion plays a consistent, if modest, role in mediating the annoyance response.

Aversion to, and escape from, noise also appears to be an important feature of those studies examining behaviour in naturalistic settings. From the data available so far it appears that purposeful evasion of the noisy settings gives rise to social consequences of the sort which involve inattentiveness to social cues. Previously these phenomena have been associated with an involuntary process arising from a change in state, but some uncertainty surrounds the generality of this interpretation.

Our discussion of laboratory effects extends the theme of strategic response to noise. A number of theoretical possibilities is available but the empirical evidence is equivocal. This is partly because the experiment itself constitutes a social setting within which noise precipitates adjustments in the utilization of processing strategies. Paradoxically this view, rather than trivializing the experimental findings, extends their generality since it concerns itself with those processes involved in the regulation of behaviour. Studies of the sort employing manipulation of such factors as perceived control highlight cognitive involvement, although again it is clear that situational demand characteristics of the laboratory setting play a mediational role. These findings can be accommodated in a model of the sort elaborated by Lazarus and his co-workers (see, for example, Folkman *et al.*, 1979). Elements of their model incorporate a mechanism (a) for appraising the significance of particular environmental events for the individual; (b) for the selection of coping strategies; and (c) for a dynamic interchange between these two components.

Finally much more needs to be known of the consequences for social interaction arising from the masking of speech in noise. We have merely adumbrated some possible consequences, among them the social isolation of individuals.

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Manuscript received: 10 October 1980
Revised manuscript received: 4 February 1981

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THE EFFECT OF PERCEIVED CONFLICT ON EVALUATIONS OF NATURAL RESOURCE MANAGEMENT GOALS

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Abstract

The use of direct judgments of goal importance in additive utility models depends on the assumption that each goal is judged independently of all other goals and that judgments are not affected by perceived conflicts between goals. In an experiment designed to test this assumption subjects read a description of a hypothetical national forest, then rated the importance of six forest management goals and the amount of conflict between each pair of goals. The management scenarios were varied to represent two levels of conflict between a wilderness preservation goal and a timber production goal, and two levels of scarcity of existing wilderness areas. Goals which conflicted with wilderness preservation were rated lower in importance when the conflict was higher and when wilderness scarcity was high. This suggests that individuals discount the importance of goals which are perceived as conflicting with a highly valued goal. These results show that direct judgments of goal importance may not satisfy the requirements of additive utility models, and that public perception of conflict between goals must be taken into account when interpreting judgments of the importance of management goals.

Introduction

In the management of natural resources, plans may be formulated and evaluated with respect to a variety of different goals. No alternative will achieve all relevant goals, so decisions must be made about which goals are the most important, and which plan represents the best compromise or trade-off between conflicting goals. Clashes between special interest groups (for example, environmentalists and industry) often occur because different people place importance on different goals, and because individuals perceive other people's goals as conflicting with their own.

In attempting to resolve disagreements between groups, managers need to understand how different groups perceive conflicts between resource management goals, and how these perceptions affect evaluations of the importance of the goals. The research reported here examines the nature of these effects and their implications for the assessment of public values in natural resource decision making.

Additive utility theory (also called multiattribute utility theory) provides one method for evaluating tradeoffs and resolving conflicts. Each management alternative is assigned values according to how well it will satisfy each relevant goal. Each goal is assigned a weight representing its importance in the overall decision. Weights and values are then combined by means of a linear additive rule:

$$V_j = \sum_i w_i v_{ij}$$

where V_j is the overall evaluation of alternative j, w_i is the importance weight assigned to goal i, and v_{ij} is the value of alternative j with respect to goal i. Additive

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models have been studied extensively with respect to perception and impression formation (Anderson, 1971, 1974) and behavioral decision theory (Slovic and Lichtenstein, 1971; Slovic *et al.*, 1977). Similar models have been developed for application to a wide variety of practical decision situations, such as highway corridor selection (Mason and Moore, 1971), land use planning (Gardiner and Edwards, 1975), and power plant siting (Seiple, 1974). In examining the underlying assumptions of additive models and evaluating how well they account for complex human judgments, special attention should be directed to the possible effects of perceived conflicts between goals.

Additive utility theory presumes that 'the utility of a whole equals the sum of utilities assigned to its parts' (Fishburn, 1967). That is, additive models assume that utilities may be assigned separately to each component of an alternative, then simply added together to obtain an evaluation of the whole alternative. For this to be possible, judgments of the effects of any one factor must be independent of the levels which other factors happen to assume. If the scales for measuring attributes of the alternatives and individuals' preferences for whole alternatives are not linear (that is, if a one-unit change in a single attribute produces a different psychological effect depending on whether that attribute already has a high or a low value) then the additivity assumption may be invalid. Failure of additivity may also result from the nature of the cognitive process by which attributes are combined to form an overall impression. For example, a high level of scenic beauty might be judged important when it occurs in combination with certain types of recreational opportunities, but less so with other types.

Research has shown that linear additive models of human judgment perform quite well in predicting actual preferences and decisions (Hoffman, 1968; Slovic and Lichtenstein, 1971; Louviere, 1974). Although deviations from additivity are detectable with sensitive experimental designs (for example, Sidowski and Anderson, 1967; Lampel and Anderson, 1968), these deviations typically involve only a small proportion of the total variance in preferences, and do not necessarily invalidate additive models for practical predictions of human preferences.

A problem arises, however, when different approaches to determining the importance weights for goals are considered. Weights may be determined indirectly by obtaining individuals' evaluations of many different alternatives and then inferring the weights statistically, for example by regression analysis. This approach, called policy capturing, is the basis for Hammond's social judgment theory (Hammond *et al.*, 1975), which has been used to resolve disagreements between individual decision makers by revealing the judgmental weights underlying their decisions.

A frequently used alternative method is to have individuals state directly the importance they think each goal should be given. Gardiner and Edwards (1975), for example, successfully used this approach to predict evaluations of coastal land use proposals. Rating scales are often used for obtaining direct importance judgments, but other response formats are possible. Baird *et al.* (1972) had subjects express importance judgments by allocating a fixed resource among competing goals. Gum *et al.* (1976) advocate a similar point allocation method for quantifying societal goals.

Unfortunately, individuals' direct judgments of the importance of separate factors comprising alternatives often do not agree with weights derived statistically from responses to whole alternatives (Slovic and Lichtenstein, 1971). When questioned

directly, respondents may indicate that they are considering all the different factors when evaluating alternatives. Statistical analysis of their responses reveals, however, that they have been basing their evaluations on only one or two factors and that the other factors have had little or no effect on their evaluations. Similarly, Louviere and Baker (1979) compared several different ways of determining weights, including direct statements and policy capturing, and found significant differences in the resulting weights.

Discrepancies between stated and inferred weights present obvious problems for the application of additive utility theory to the assessment of public values. Different procedures for deriving weights could result in different outcomes when they are used in an additive utility decision model. But even if public values are not represented by means of a formal model, the basic problem remains. For example, an agency using a questionnaire to obtain public input may ask people to assess the importance of general management goals, or to evaluate specific management proposals. If individuals implicitly give goals different weights when evaluating proposals than when evaluating goals directly, these two options may produce inconsistent results, regardless of whether the public responses are analyzed informally or with a mathematical utility model.

To interpret public input meaningfully, planners need to understand the causes of inconsistences in human judgments of complex alternatives. One hypothesis is that individuals have trouble integrating information about complex alternatives, and therefore adopt simplified decision strategies to facilitate the judgment task (Slovic and Lichtenstein, 1971). Shepard (1964) suggests that judgments made according to simplified strategies may not adequately represent the individual's true preferences for alternatives when they are actually carried out. If this is so, it might be better to ask individuals to evaluate directly the importance of individual components or goals of a decision problem, and then use a formal model to combine these simpler judgments into overall evaluations of each proposed plan.

Alternatively, direct statements of the importance of goals may be an inaccurate reflection of public values regarding resource management plans. The use of directly stated weights in additive utility models requires that the factors of the model be logically and cognitively independent of each other (Churchman *et al.*, 1957; Kaufmann, 1968). That is, when people evaluate the importance of factors or goals, they must be able to think about each goal as though it had no effect on any other goal. In natural resource management, where conflicts and trade-offs between goals are likely to be a prominent feature, this may be difficult to do. For example, when wilderness preservation and utilization of forest resources are two goals in a forest management decision situation, a person may believe that utilization of resources always means that wilderness values will be destroyed. Although evaluating resource utilization negatively because of its presumed impact on wilderness, an individual might have no objection to resource utilization *per se*, once convinced that it need not compromise the preservation of wilderness. If this person's directly stated importance weights for the two goals are used in an additive utility decision model, the value of wilderness will be double-counted, once in the importance weight of the wilderness goal itself and again via the reduced importance weight for the resource utilization goal. It is important to note that this occurs because of the person's beliefs (possibly mistaken) about the relationships between goals, and need not depend on the actual relationships.

The experiment reported below was designed to determine whether judgments of a goal's importance are influenced by the extent to which the goal is perceived as conflicting with other goals. If this is the case, then direct statements of importance may not conform to the assumption of cognitive independence, and additive utility models based on these importance weights may not accurately reflect public values.

In addition, the experiment investigates the sensitivity of goal importance judgments to the regional context of the resource management problem. The perceived importance of a goal in a specific management problem might depend on what other opportunities are available for achieving the same goal in the general region. On the other hand, importance judgments might be based upon general fixed attitudes or orientations of the respondents, in which case they might not be sensitive to conditions of scarcity or demand. Gauging the effect of scarcity on importance judgments may contribute to our understanding of the psychological processes by which people make such judgments.

Method

Subjects completed procedures which presented information about a hypothetical forest planning situation. They made judgments of the importance of six different management goals, and of the extent to which goals conflicted with each other. The questionnaire was designed to resemble a type of response form which might be used in a public participation program, and consisted of the following parts.

(1) *Introduction to the study*. Participants were told that the management scenario in the questionnaire represented the kinds of situations which actually occur in real decision making and that their responses would contribute to our understanding of how the public places values on different management goals. The introduction did not say anything about conflicts or trade-offs between goals.

(2) *The management scenario*. The scenario dealt with a 'typical' national forest in the western United States. Different subjects were given different descriptions, designed to vary along two dimensions.

(a) *Conflict*. Two levels of a specific conflict between goals were represented in the scenarios. In the high conflict condition, an area of virgin forest containing large amounts of timber which could be economically harvested created a conflict between the goal of preserving wilderness and the goal of producing timber. In the low conflict condition, timber harvesting in the virgin area was not practical due to severe terrain.

(b) *Scarcity*. Two levels of scarcity with respect to the goal of preserving wilderness were presented. In the low scarcity condition, a large officially designated wilderness area already existed close to the national forest described in the questionnaire. In the high scarcity condition there were no existing wilderness areas nearby.

The conflict and scarcity dimensions were crossed, resulting in four different scenarios in a two-by-two factorial arrangement. The manipulations of conflict and scarcity were embedded in a fixed context of information pertaining to the general management situation. For comparison, an additional group was given no management scenario at all, but was asked to make judgments with respect to national forests in general.

(3) *Descriptions of the management goals*. The six goals used in the questionnaire are summarized:

(a) maintain a maximum level of timber production;
(b) maintain a high level of scenic beauty;
(c) preserve wilderness in its natural state;
(d) increase employment in local communities;
(e) maintain wildlife populations;
(f) provide a source of water for local communities.

Each goal was explained briefly.

(4) *Importance ratings.* Participants rated each goal according to how important they thought it should be in deciding how to manage the forest described in the questionnaire. The rating scale ranged from a low point of zero, meaning that the goal had no importance and should be disregarded, to a high point of ten. The goals were presented in different random orders to different participants.

(5) *Conflict ratings.* Participants rated the degree to which goals conflicted in the management scenario. All 15 possible pairs of the six goals were presented in different random orders to different subjects. A rating of zero indicated that two goals did not conflict at all, and a rating of ten indicated that the goals were very incompatible.

(6) *Follow-up questions.* Participants were asked to explain in their own words which goals they thought were the most and the least important, and why. They were also asked which two goals conflicted the most, and why.

Participants were recruited from psychology classes where an extra credit incentive was offered. One hundred and thirty-five students took part in the study, 28 in the high-conflict/high-scarcity, 26 in the low-conflict/low-scarcity condition, and 27 each in the high-conflict/low-scarcity, low-conflict/high-scarcity, and control (no scenario) conditions. College students represent one group of individuals who are likely to be concerned about environmental issues and affected by management decisions. Obviously, the results obtained with this group might not generalize to other public groups. The purpose of the present study is, however, not to obtain a general sample of public attitudes, but to explore the process by which individuals make judgments. The use of a limited sample is appropriate as a first step toward this goal.

Results

The study was designed to investigate the way in which perceived conflict and scarcity affect evaluations of the importance of resource management goals. The principal analysis focuses upon the effects of the experimental manipulations on importance evaluations, and on the relationship between rated conflict and rated importance. The conflict manipulation was directed at the timber and wilderness goals, and the scarcity manipulation specifically involved the wilderness goal. Depending on how individuals perceive the interrelationships among goals, the experimental manipulations might also affect evaluations of other goals and conflicts. The analyses below, therefore, include importance and conflict ratings for all of the six management goals.

Conflict Ratings

The conflict ratings give information about which specific goals were perceived by participants as conflicting the most. Generally, the differences between the four experimental groups were less than the differences between pairs of goals within

groups. That is, the experimental groups perceived the conflicts in much the same way. Also, the control group, who had no specific management scenario, rated the conflicts in much the same way as the experimental groups. For example, the conflict between wilderness and timber was given a mean rating of 8·37 by the control group. Under the high conflict manipulation, this conflict was rated slightly higher ($\bar{x} = 9{\cdot}13$) and under the low conflict manipulation it was rated slightly lower ($\bar{x} = 8{\cdot}09$). It appears that subjects in this study already had preconceptions about which goals conflicted with each other before reading the scenarios, and that these preconceptions were only slightly altered by the specific conflict manipulation.

Table 1 shows the conflict ratings averaged across all five groups (experimental and

TABLE 1
Mean conflict ratings averaged across all groups

	Wildlife	Scenic beauty	Timber	Local employment	Water
Wilderness	0·75	1·74	8·57	6·67	4·06
Wildlife		1·44	7·62	5·54	3.63
Scenic beauty			7·86	4·99	3·38
Timber				1·19	3·44
Local employment					2·25

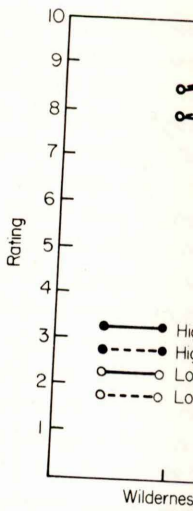
control) in the form of a conflict matrix. The wilderness, wildlife, and scenic beauty goals were clearly perceived as being compatible with each other, while the timber goal is seen as conflicting strongly with all of the first three goals. Employment is compatible with timber and conflicts with the first three goals, though not as strongly as timber does. Water supply shows intermediate conflicts with most of the other goals and seems most compatible with local employment.

From the conflict ratings there appear to be two groups of goals. Wilderness, wildlife, and scenic beauty form one group, and timber, employment and possibly water supply form another. Goals within the same group are perceived as compatible, while goals in different groups are seen as conflicting. Goals in the first group are generally preservation oriented, while goals in the second group are utilization oriented.

Importance Ratings

To study the effect of the experimental manipulations on the amount of importance attached to specific goals, an ANOVA was performed on importance ratings, with conflict, scarcity, and goals as independent variables. (A few subjects were deleted at random to yield equal N's of 26 in all four conflict/scarcity conditions). The mean importance ratings for the experimental groups are plotted in Figure 1. In most conditions, wilderness and wildlife were given the highest importance, while timber and employment were rated the lowest. The ANOVA showed a significant effect of the goal factor ($F = 35{\cdot}10$; $df = 5{,}500$) indicating that these differences are statistically reliable.

There is a main effect of scarcity ($F = 4{\cdot}29$; $df = 1{,}100$), with importance ratings being generally higher in the low scarcity conditions. This appears to be more true for utilization-oriented goals (timber, employment, and water) than for preservation-oriented goals (wilderness, wildlife, and scenic beauty). It also appears that these two



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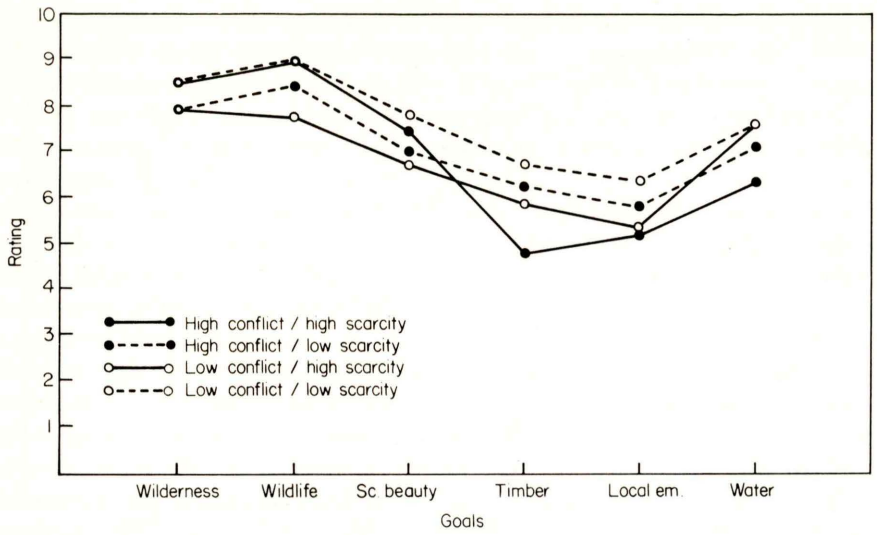

FIGURE 1. Goal importance ratings.

groups of goals were affected differently by the conflict manipulation. The utilization goals are rated consistently lower in the high conflict conditions, but this difference does not occur with the preservation goals. This is what would be expected if individuals are discounting a goal's importance when it conflicts with another goal which is valued highly.

This interpretation is supported by comparing the control group's ratings of the timber goal's importance to the experimental group's ratings. The high conflict/high scarcity group rated timber lower in importance ($\bar{x} = 4{\cdot}79$) than the control group ($\bar{x} = 6{\cdot}07$) while the low conflict/low scarcity group rated it higher ($\bar{x} = 6{\cdot}65$). But all the groups (including the control group) rated wilderness as more important than timber. It appears that subjects in this study already regarded wilderness as more important than timber even before reading the management scenario. The specific conflict and scarcity manipulations then led people to modify their judgment of the timber goal, though still always rating it as less important than wilderness.

The interactions of the goal factor with the conflict and scarcity manipulations, which would reflect the effects of the manipulations on specific goals, are not statistically significant in this ANOVA. Examination of subjects' ratings showed that while almost half of them gave wilderness the highest possible rating, several subjects in each condition gave wilderness substantially lower ratings. This suggests that the failure of the ANOVA to detect significant effects may be due to a diversity in subjects' initial attitudes toward wilderness preservation.

Systematic variation in ratings due to attitude differences could increase the size of the error terms, making the effects harder to detect. To remedy this, individuals were placed in different groups, depending on how they rated the wilderness goal. The ten individuals in each experimental condition who gave wilderness the lowest ratings were placed in a 'low-wilderness' group, and ten (randomly selected) individuals from each condition giving wilderness a rating of ten were placed in a 'high-wilderness' group. (The other six individuals in each condition were omitted to maximize the difference

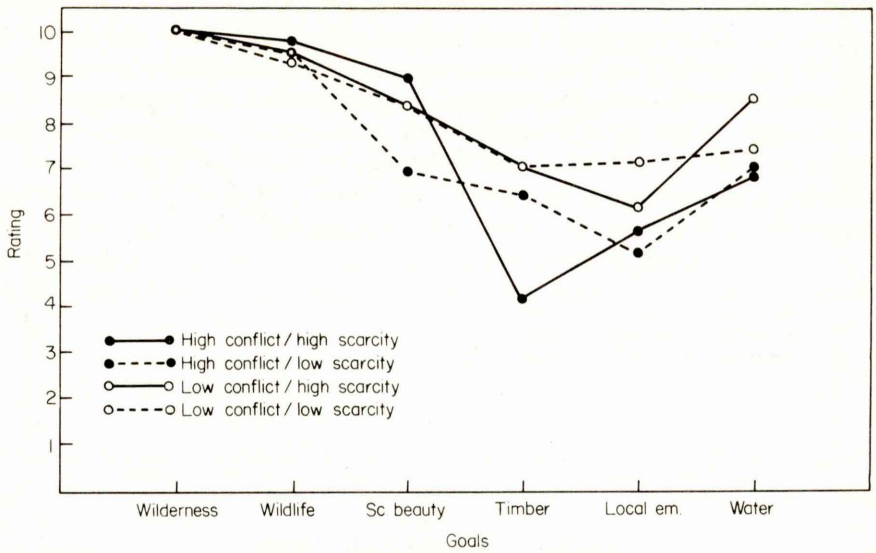

FIGURE 2. Goal importance ratings for the high wilderness group.

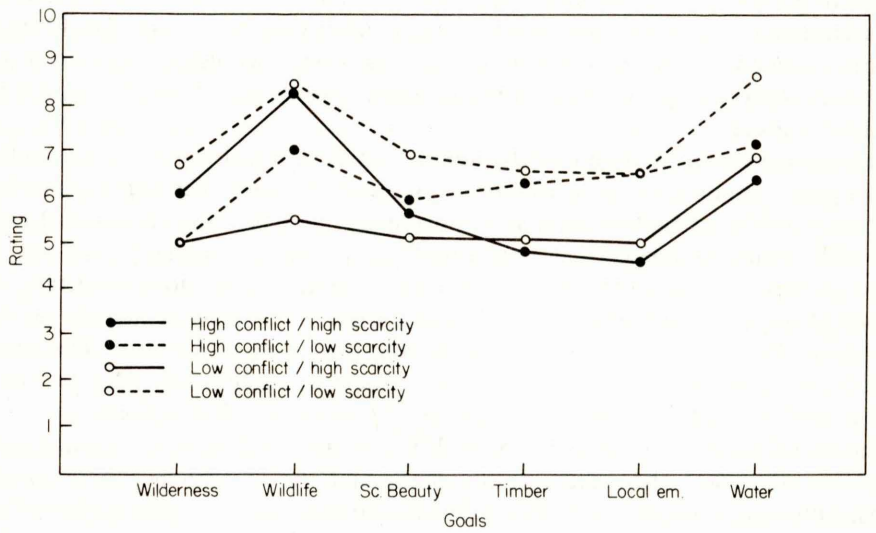

FIGURE 3. Goal importance ratings for the low wilderness group.

between the groups.) The ANOVA was then repeated, adding wilderness attitude as an additional factor, and omitting wilderness from the goals factor (because it was used as the criterion for forming the wilderness attitude groups).

The mean ratings for the high-wilderness group are plotted in Figure 2, and for the low-wilderness group in Figure 3. The graphs verify that the two groups do indeed differ substantially in their ratings of the wilderness goal. Overall, the low-wilderness group gave lower importance ratings than did the high-wilderness group ($F = 15{\cdot}36$; $df = 1,72$). An interaction between goals and wilderness attitude ($F = 5{\cdot}17$;

$df = 4,288$) appears because the high wilderness group rates wildlife and scenic beauty higher relative to the other goals than does the low-wilderness group. Wilderness attitudes also interacted with scarcity ($F = 6{\cdot}20$; $df = 1,72$). The low-wilderness group seems to have been more sensitive to wilderness scarcity, giving consistently higher ratings, especially to the utilization goals, when wilderness scarcity was low than when it was high.

Wilderness scarcity and conflict between wilderness and timber both have significant effects on importance ratings ($F = 5{\cdot}46$ and $4{\cdot}11$, respectively; $df = 1,72$) and the three-way interaction of goals with scarcity and conflict confirms that these effects were different for different goals ($F = 2{\cdot}70$; $df = 4,288$), and therefore not due to a general shift in response bias. Specifically, under the high conflict/high scarcity condition, the three utilization goals, which conflict the most with wilderness preservation, are given relatively low ratings compared to the other conditions, and the two goals which are most compatible with wilderness (wildlife and scenic beauty) are given relatively higher ratings. Timber was rated especially low by the high-wilderness group in the high conflict/high scarcity condition. This again confirms the hypothesis that importance ratings of different goals are not made independently, but are influenced by the amount of conflict between the goals. The individuals who value wilderness the most have discounted the importance of timber strikingly when wilderness is both scarce and threatened by proposed timber harvesting.

TABLE 2
Scale values from non-metric MDS of conflict ratings

	High conflict		Low conflict		
	High scarcity	Low scarcity	High scarcity	Low scarcity	Control
Wilderness	118	95	88	93	102
Wildlife	98	94	87	94	102
Scenic beauty	67	90	87	93	96
Timber	−142	−131	−171	−132	−105
Local employment	−102	−129	−89	−128	−100
Water	−40	−19	−3	−20	−95

Relationships between Conflict Ratings and Importance Ratings

The specific conflict and scarcity manipulations used in this study had consistent effects on the rated importance of the management goals. The magnitudes of these effects were, however, rather small compared to the general differences between the rated importance of preservation goals (e.g. wilderness) and utilization goals (e.g. timber production).

The responses to the follow-up questions suggest, however, that importance ratings may have been greatly affected by fixed preconceptions about conflicts between goals, and that these preconceptions were relatively unaffected by the experimental manipulations. Many subjects in all groups made specific references to conflicts between goals when explaining their importance ratings. For example, timber production was

often rated as the least important goal, because it was seen as a threat to wilderness and wildlife. Reasons for high ratings of the conflict between wilderness and timber were usually stated in general terms, with very few references to specific features of the management scenarios. The relationship between perceived conflict and evaluations of importance was investigated by means of non-metric multidimensional scaling (Kruskal, 1964). The conflict ratings were treated as dissimilarity judgments (that is, goals which did not conflict were taken as being similar to each other). A one-dimensional space fits the conflict ratings very well for each group of subjects, and the relative positions of the goals on this dimension are very similar from group to group (Table 2). Correlations between groups across the six goals range from 0·888 to 0·999.

The average correlation between the MDS scale values for the six goals and the importance ratings for the goals is 0·80, showing that the relative positions of goals on the conflict and importance dimensions are similar. This relationship is particularly strong ($r = 0{\cdot}96$) for the high-conflict/high-scarcity group.

It is not possible to conclude from this analysis that importance evaluations are determined by fixed preconceptions about conflicts (or vice versa) but the results suggest that there is a substantial relationship between the two types of judgments. It may be that both conflict and importance judgments in this study were made with respect to an underlying cognitive dimension (such as preservation versus utilization) and that this underlying dimension became more salient in the scenario which emphasized the conflicts between preservation and utilization.

Discussion

The purpose of conceptualizing a resource management problem in terms of a small set of goals or factors is to make possible a systematic assessment of proposed alternatives, to guide the formulation of new alternatives, and to provide a reasonable means for including public values in the decision process. Public values may take the form of weights in an additive utility model. Alternatively, evaluations of different goals may be used more informally by planners to anticipate public response to proposed management actions. In either case, it is important to understand the various factors which can affect judgments of goals, and to identify the assumptions which underlie any particular interpretation or use of such judgments.

This study has shown that conflicts between goals can influence the way in which people evaluate the importance of the goals, as can the availability of other opportunities for achieving specific goals. When importance ratings are to be used as weights in a formal decision model, these findings have both theoretical and practical implications. To avoid the problem of double-counting, formal models require that importance weights reflect the importance of each goal independently of all other goals. That is, the judged importance of a goal should not reflect the effects which actions toward achieving that goal will have on other goals relevant to the decision. But in natural resource decision situations, a person is likely to react very strongly to the conflicts between different goals, and these perceived conflicts may dominate the person's judgments about which goals should be emphasized. It may be difficult or impossible for people to judge each goal independently of its interrelationships with other goals. The fact that the timber goal, for example, was rated less important under the specific high conflict condition in this study suggests that its importance

might be underestimated if these importance ratings were used as weights in a decision model.

The consistent pattern of effects of a specific conflict manipulation on rated importance in this study indicates that these are real problems which must be considered when using formal decision models. Although the effects of the conflict manipulation were relatively small (perhaps because of the hypothetical nature of the scenarios), the MDS analysis and the answers to the follow-up questions suggest that preconceived attitudes about conflicts played a substantial role in producing lower ratings for utilization goals than for preservation goals. The MDS analysis also suggests that value and conflict judgments may be made with respect to general underlying attributes of the goals (such as preservation/utilization). If this is so, then decision models might be improved by formulating them in terms of such underlying attributes. If orthogonal attributes can be inferred from conflict and importance ratings, and importance weights attached to them, the problem discussed above could perhaps be surmounted.

The results reported here also suggest some more general considerations, which apply to any attempt at assessing public values about resource management goals. If public groups react negatively to a particular goal, the planner should determine whether the goal is seen as intrinsically irrelevant (or undersirable), or whether the goal is perceived to conflict with some other important goal. An assessment of how the public perceives conflicts between goals should routinely accompany the assessment of importance of the goals, since misunderstandings may result if the planner does not know which goals are perceived as incompatible. When some of the goals being assessed are closely related in people's minds (e.g. wilderness and scenic beauty) attention must be paid to how this affects importance evaluations. For example, responses to the follow-up questions revealed that some individuals gave scenic beauty a low rating, not because they disapproved of it, but because they felt there was no need to worry about it as long as the wilderness goal was carried out.

If individuals use general cognitive dimensions, such as preservation/utilization, as a basis for evaluating importance and conflict, then it would be very helpful to identify any such general dimensions and to identify the circumstances in which preconceptions about them will dominate responses to goals. The type of questionnaire used in this study, with very brief, general descriptions of goals, a hypothetical scenario, and a rapid response format, may have enhanced the tendency to rely on preconceptions about how the goals are related to such general cognitive dimensions. Perhaps in a real planning situation, in which interested individuals deal with more detailed information about real decision problems, specific features of the planning problem would have a larger effect on goal evaluations than they did with the hypothetical scenarios used in this study.

The present study has limitations which must be considered when interpreting the results. The population consisted mostly of undergraduate psychology students, the majority of whom were in favour of wilderness preservation. This group represents one constituency concerned about resource management, but a more general study should also include individuals who are more disposed toward development and utilization of natural resources. To improve our understanding of the process by which judgments of resource management goals are made, the present research should be extended to include more general public groups and more realistic planning situations. A wider selection of goals should be investigated, and different response formats tried.

It may be that formal decision models will work better in workshop situations, where time can be taken to explain to participants how their responses will be used, and to discuss in detail the goals and the management situation.

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Manuscript received: 17 September 1980
Revised manuscript received: 23 December 1980

Journal of Environmental Psychology (1981) **1**, 73–85

BOOK REVIEWS

MEANING IN ARCHITECTURE: NEW DIRECTIONS AND SOURCES

LINDA GROAT

Signs, Symbols, and Architecture edited by Geoffrey Broadbent, Richard Bunt, and Charles Jencks. New York: Wiley, 1980.

Architecture and its Interpretation by Juan Pablo Bonta. New York: Rizzoli International Publications, Inc., 1979.

Meaning in the Urban Environment by Martin Krampen. London: Pion Limited, 1979.

A Psychology of Building by Glenn Robert Lym. Engelwood Cliffs, New Jersey: Prentice-Hall, Inc. 1980.

Complicity and Conviction: Steps towards an Architecture of Convention by William Hubbard. Cambridge, Massachusetts: The MIT Press. 1980.

Geoffrey Broadbent is currently head of the School of Architecture at Portsmouth Polytechnic in Portsmouth, England. He is the author of numerous books and articles on the topics of architectural education and research—including Design in Architecture (*Wiley Ltd., 1975*).

Richard Bunt is a practicing architect and lecturer at Portsmouth Polytechnic. He studied at the Architectural Association in London and received his Ph.D. at University College London. Charles Jencks lectures at both the University of California, Los Angeles, and the Architectural Association. A Harvard graduate and London University Ph.D., he is the author of numerous articles and books, including Modern Movements in Architecture (Penguin Books, 1973) and The Language of Post-Modern Architecture (Rizzoli, 1977).

Juan Pablo Bonta is currently teaching at University of Maryland. He received his architectural training at the University of Buenos Aires and early in his career worked as a practicing architect. More recently, he has taught architecture at the University of Buenos Aires, Portsmouth Polytechnic, the Architectural Association, and Ball State University in Muncie, Indiana. He has lectured widely in both the United States and Europe and is the author of numerous papers and articles.

Martin Krampen is affiliated with the Hochschule der Künste (Art Institute) in Berlin. He is the author of numerous papers and articles on the topic of meaning in the built environment.

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San Francisco Bay area as a designer and more recently as a research consultant. Her work in both design and research has been published in a variety of architectural journals.

Architecture today is suffering from a profound crisis of identity, the resolution of which may ultimately hinge on a question of psychological significance: what is the role of meaning in the experience of architecture? Many architects, in their efforts to chart a new direction for the profession, have embraced the notion of meaning as a fundamental principle of design. The emergence of major journal articles and books on the topic attests to the importance this question has now assumed in architecture. Given this state of affairs, it may be that architects would now welcome the contribution that environmental psychologists could make in resolving an issue of such importance to the profession.

The five books, listed above, should be of particular interest to environmental psychologists, because they offer important clues as to how empirical research might be brought to bear upon this emerging body of architectural theory. Each of the books reviewed here deserves attention on one or more of the following grounds: (1) the elaboration of a theoretical model; (2) the suggested links between the empirical literature and architectural theory; and/or (3) the implicit presentation of hypotheses (either in the form of critical analysis or specific building design) which might be appropriately tested through empirical research.

A word of caution must be offered, however, because the reader who expects to find direct and obvious ties between these newly published books and the earlier environmental psychology research on meaning in architecture will be disappointed. The recent work is distinct from the early studies both on the basis of: (1) its ideological roots—an architectural perspective and/or the use of semiotic analysis; and (2) the scope of its focus—a concern for connecting specific physical forms with particular meanings. Understanding the common ideological sources and foci of the recent publications is an important prerequisite for evaluating their potential contribution to environmental psychology research. Thus the following brief discussion of the roots and scope of current architectural theory is intended to serve as a useful preamble to the review and criticism of the individual books.

New Sources and Directions

The reemergence of theory and criticism as a potent force in architectural practice is, to a large extent, the result of the reevaluation (and, among some, the rejection) of the tradition of Modernist architecture. For more than 50 years, the respected values of architecture have been those derived from the Bauhaus and International Style dogma. However, for at least a decade, critics (including some environmental psychologists) have been pointing out that, despite the Modernist dictum that form must follow function, a rather high proportion of Modernist buildings are neither functional nor formally pleasing. With support for Modernist values dwindling, architects have scrambled to discover new guiding principles. Some have found refuge in historical revival or in the eclectic application of traditional styles; others have tried to transform the sleek qualities of Modernism into richly imagistic forms; and still others have attempted to invent totally new relationships of form and space. Yet a common theme in all of these efforts is a concern for manipulating the meanings

evoked by the experience of architecture, a principle which the Modernist tradition had carefully eschewed.

All five books being considered here are more or less products of these trends in architecture; yet certain authors are more keen than others to set themselves in opposition to Modernist values. Broadbent and Jencks, for instance, in their own articles generally assume an anti-Modernist stance, while Hubbard puts himself in opposition to not only Modernism but Post-Modernism (the successor to Modernism) as well. On the other hand, Lym avoids anti-Modernist rhetoric entirely. Between these two approaches are Bonta, Krampen, and most of the authors in the Broadbent/Bunt/Jencks collection* who view the Modernist demise from a more detached perspective which emphasizes instead the contribution of semiotics as an analytical tool in the generation of architectural theory.

Semiotics, the science of signs, thus represents the other major source for the current investigations into the role of meaning in architecture. The influence of semiological analysis has affected not only the development of architectural theory but also the design strategies of some of the major architects in practice today. Most of the current studies in architectural semiotics derive from the work of Ferdinand de Saussure who, in the development of his *Course in General Linguistics* (first published in 1916) proposed general theory of signs which he called semiology.† The essence of his argument was that language is a primary example of a system of signs (a sign being defined as something that stands for something else). Now, 70 years later, semiologists are exploring the nature of meaning in architecture with the assumption that architectural signs are to some extent analogous to the system of signs within language.

An essential concept in Saussure's work is his division of the sign into two components—the signifier and the signified. In linguistics, the term signifier refers to the sounds or the marks on paper which stand for the signified, i.e. the concept or ideas. In architecture, the analogy is usually understood to be as follows: that the building or its formal details (as the signifier) stand for certain meanings or concepts which are the signified.

The validity of this analogy need not concern us here; however, it is important to note that the architectural semiologists' interest in this type of analysis does serve to point out the significant differences of focus between their work and the early environmental psychology research. The early empirical studies (Canter, 1968; Craik, 1968; Hershberger, 1969, 1972; and Vielhauer-Kasmar, 1970) were derived from the work of Osgood (1957) and demonstrated a primary concern for the dimensions of meaning, or in other words, *the signified.* Canter (1975), in his review of this work, summarizes it by saying that the intent of these studies was a search for 'those general dimensions which may be shown to exist in all cases [environments]'. In contrast to this, the current work in architectural theory is concerned equally with both components of the sign—*the signifier as well as the signified.* In other words, the current writers emphasize the analysis of physical form as it relates to specific meanings. Krampen, for instance, is interested in clarifying the *semantics* of architectural language; and so, in his effort to uncover what specific forms mean, he has

* Henceforth abbreviated BBJ.

† An American, C. S. Peirce, contemporaneously argued for the development of a science of signs which he labelled semiotics; but it was Saussure's work which ultimately became more influential. Both terms—semiotics and semiology—will be used interchangeably in this article.

studied the relationship between building forms and details to the identification of building types. In a different vein, Bonta, who wishes to explore the nature of architectural criticism, is more interested in the *process* of how certain meanings become associated with physical form. But whether process or semantics is the focus of study, each of the current writers is attempting to study the system of architectural signs in terms of both signifier and signified.

An Overview of Architectural Semiotics

For environmental psychologists who may be unfamiliar with semiotics and the associated jargon, analyses such as the division of the sign into signifier and signified may seem obscure or ambiguous. For this reason, *Signs, Symbols, and Architecture* edited by Broadbent, Bunt and Jencks may turn out to be a useful introduction to the origins, potentials, and shortcomings of semiotic analysis in architecture. The editors have collected a broad range of papers representing some of the pioneering material in the field, some of which had not previously been available in English.

The book is divided into three major sections. The first section, introduced by Jencks, is intended to provide a general overview of the issues raised by architectural semiotics. Section II, presented by Broadbent, contains specific applications of semiotic analysis to the subject of architecture. And finally, Section III highlights the theoretical conflicts being argued among a group of Italian semiologists. Of the three sections, the first two are likely to be of the most interest or use to environmental psychologists. The main value of these first sections is simply that they provide a general introduction to the basic terminology, key concepts, major themes, and specific applications of architectural semiotics.

The success of *Signs, Symbols, and Architecture*, cannot, however, disguise the basic lack of a coherent and comprehensive vision of how semiotics, and the linguistic analogy in particular, ought to apply to architecture. The editors themselves even admit their own sense of disappointment in the output of the field. Jencks, for example, writes in his introduction to Section I:

> 'Like psychoanalysis around 1910, it [semiotics] is expanding fast with books, international conferences and inflated pretensions, and it can now generate just about the same amount of excitement, anger, and jargon. Should we applaud its temerity or fault its pedantry? I don't know, but I do think everyone acquainted with the history of semiotics will feel at the same time its ennobling sense of promise, its grand catholic sweep, and some of its exasperating failure.'

Broadbent echoes these sentiments when he admits that semiotics 'provides descriptive tools of an exceedingly interesting kind, but is in no way prescriptive of what one should do next.'

The editors' own skepticism about the ultimate value of semiotics might be enough to put the reader off the subject for good, except for their suggestion that the complementary application of semiotics AND environmental psychology might eventually yield highly useful analyses. Broadbent, in fact, argues in the main introduction to the book that neither semiotics nor environmental psychology alone 'throws sufficient light on the subject but the two together offer some of the most exciting developments in the whole of architectural research.' To help solidify the

connection between the two fields, editors Broadbent and Bunt promise a forthcoming collection of articles of a more empirical nature in *Meaning and Behavior in the Built Environment*. Perhaps this second volume may turn out to be even more useful than the present one in suggesting links between semiotics and environmental psychology.

Although the content of the BBJ collection is primarily theoretical, two pieces of empirical work are nevertheless presented. One of these is a mini-study of James Stirling's Olivetti Training Centre (Haslemere, England) conducted by Jencks. The building in question is a high-tech addition to an Edwardian mansion. Through the use of interviews, Jencks elicited the common 'metaphors' evoked by this building. Those who disliked the building tended to see it as a caravan, horse trailer, or trash can; whereas those who liked it tended to see it as a train, bus, or Olivetti machine. Jencks argues that the architectural message (metaphor) is significantly influenced by the predilections of the viewer, that non-architects are typically predisposed to like architecture which conforms to a more traditional imagery, and that architects often fail to take this into account. The result is either buildings which have been designed without awareness of their metaphorical potential *or* buildings that fail to evoke meanings compatible with the architect's intended metaphor.

This is a theme that Jencks has developed elsewhere, most notably in his book, *The Language of Post-Modern Architecture* (1977), a watershed publication in the realm of architectural criticism. His analyses of buildings are typically made without reference to empirical research (even of the type he employed with the Olivetti Centre); and as a result this sort of criticism is actually a potential gold mine for empirical research studies. Whereas the traditional critic has usually discussed buildings merely in terms of historical trends or stylistic characteristics, Jencks is actually evaluating buildings on the basis of assumed psychological impact, that is, on the meanings they evoke. His argument against Modernism is that Modern buildings are meaningful primarily to professional architects but are otherwise banal or alienating to the general public. This itself is not an unusual argument, but Jencks goes on to suggest specific buildings which he considers successful in evoking a rich set of meanings. The question is: do they? Here are untested hypotheses that are likely to influence the design strategies of practicing architects and ultimately the built environment; yet to date only one study (Groat and Canter, 1979) has tested Jencks assumptions. This study concluded, in fact that some of the Post-Modern buildings which Jencks considered successful were no more appealing or expressive of intended meanings than certain Modern buildings. These conclusions suggest that this type of architectural criticism is exceptionally fruitful territory for empirical research.

Linking Semiotics and Psychology in the Context of Architectural Criticism

Architectural criticism is the focus also of J. P. Bonta's book *Architecture and Its Interpretation*. But rather than using architectural criticism as a source for empirical research (as the Groat and Canter article suggests), Bonta uses architectural criticism as a source for what he calls 'text analysis'. He argues, in fact, that 'an entire theory of meaning in architecture' can be achieved through the analysis of descriptive texts of critics and other writers. Thus the essence of Bonta's approach is the exhaustive and systematic analysis of critical texts as they relate to specific and discrete areas of architectural meaning. Topics to which Bonta has applied his method of text

analysis include the study of particular periods or styles (for instance, his analysis of the contradictory interpretations of the Chicago School architecture) as well as the study of single buildings (for example, his review of the changing interpretations of Mies van der Rohe's Barcelona Pavillion over a period of fifty years).

The purpose of these analyses is, however, more limited than what one might initially expect. As an architectural semiologist, Bonta is interested not so much in *what* particular forms mean, but *how* they mean the things they do mean. In making this distinction, Bonta is arguing in concert with other semiological theorists that the only proper role for semiological analysis is to answer this question: *how* do buildings come to have certain meanings? The question of *what* things mean, he argues, is more appropriately within the purview of psychology or criticism. Thus Bonta is concerned with such issues as which traits of form convey meaning, the process by which meanings change, and so on. In the pursuit of these questions, Bonta offers some exceedingly interesting examples—for instance his detailed analysis of the changing interpretations of the Barcelona Pavillion and his taxonomy of signs (indicators as he calls them). Unfortunately, Bonta has treated each of these and other themes in what seem to be almost self-contained chapters. As a result, it is very difficult to understand the relationship (if indeed there is one) between the change of interpretations of the Barcelona Pavillion and, for instance, the semiotic analysis of architectural movements.

Despite the somewhat disjointed quality of *Architecture and Its Interpretation*, certain of Bonta's analyses are particularly useful because of their obvious relevance to empirical research. Especially pertinent here is Bonta's evaluation of the comparative benefits of environmental psychology and critical text analysis in investigating the meanings buildings actually have for people. He argues that each research method offers special qualities which are complementary to the other. Thus he sees empirical methods as being particularly effective in generating data on the 'quick inattentive reactions' of people (particularly laypeople) to their environment. And conversely, he considers the analysis of critical texts as being particularly sensitive to historical change and to the subtlety and depth of architectural interpretations.

Evidence of Bonta's willingness to consider the contributions of psychology appears in other aspects of Bonta's work as well. In one instance Bonta expands upon an established psychological concept, and in another he draws upon a psychological model for his semiological analysis. Both examples are of interest here because they suggest the means by which psychologists can link an empirical approach to architectural semiotics. For this reason, it is important to consider such examples of conceptual compatibility in some depth.

In the first case, Bonta discusses the notion of expressive system—which he developed out of an analysis of contradictory interpretations of certain notable buildings—in relation to the notion of perceptual context as employed by psychologists. Bonta's analysis of architectural criticism leads him to conclude that a single building might be considered horizontal, for example, so long as it were compared to one set of buildings; yet the same building might also be considered vertical in comparison to a different set of buildings. Therefore, Bonta maintains, a system of forms should not be construed as being limited to the immediate perceptual context, but rather should be expanded to include 'all other forms taken into account by the interpreter'.

This analysis also relates to the second instance of Bonta's acknowledgement of

psychological concepts. In defining what constitutes a 'system of forms', Bonta draws upon the concept of categories as elaborated by Bruner et al (1956) in *A Study of Thinking*. Thus he argues that interpreting a facade amounts to classifying it according to a set of characteristics which can also appear in other works of architecture. In this sense, a building can belong simultaneously to more than one category or system of forms. But now what? Unfortunately, Bonta moves on to another topic and chapter, leaving the interested reader wondering what to do with these intriguing links to psychological research.

Semiological Theory as a Basis for Empirical Research

At this point it is useful to turn to Martin Krampen's book *Meaning in the Urban Environment*, because Krampen's goal (unlike Bonta's) is to operationalize some of the most relevant concepts from semiotics. Krampen is a German environmental psychologist who has painstakingly evaluated the range of semiological material for its appropriateness in formulating a model of meaning in architecture which he can then use as a basis for a carefully designed set of empirical studies.

Krampen's rather lengthy presentation and analysis of current semiological theory is often thick with specialized and esoteric terminology, and as a consequence it is sometimes difficult to follow; but his dogged search for useful and relevant concepts ultimately makes it worth the reader's effort. Krampen's critical evaluation of the literature leads him to conclude that the linguistic analogy (though commonly used as a source for architectural semiotics) is inadequate as a model of architectural meaning and, moreover, has resulted in a series of 'logical errors'. The essence of these errors is that, by treating language and architecture as analogous, architectural semiologists have been led to search for architectural units equivalent to linguistic units such as words, phonemes, syntax, etc. These mistakes can be avoided, he suggests, by considering both linguistic signs and buildings as specific examples of a wide range of human objects or instruments, all of which function as signs. Thus architectural objects would no longer be treated as a subset of linguistic signs; instead both would be treated as a subject of a general class of instruments. The implication of this argument is that the study of architectural meaning would employ only those concepts which pertain to the study of *object* meanings in general (such as signified and signifier) and reject those concepts which pertain exclusively to linguistic analysis (such as syntax and phonemes).

This point of view is not entirely unique to Krampen. Preziosi (1979) has written two books (quite independently of Krampen's work) which make essentially the same point, that the linguistic analogy is an inadequate model for analyzing the meaning of built form. However, Preziosi's books—*The Semiotics of the Built Environment* and *Architecture Language and Meaning*—are written from a theoretical rather than empirical perspective, so they are less immediately applicable to the field of environmental psychology.

Krampen continues his analysis of semiotic theory by pointing out that a major oversight of the linguistic analogy has been to ignore an essential contribution of phonology—the act of classification. According to this model, people recognize speech sounds by distributing them into abstract classes called phonemes. Echoing Bonta's application of Bruner's work, Krampen extends this act of classification into the realm of architecture and then adds to it the concepts of set theory. Briefly, the

resulting model of building recognition is based on the assumption that a building is known only by virtue of opposition between sets. To this model Krampen then attaches the important semiological distinction of denotation and connotation. Krampen argues that a building is first classified on a denotative level on the basis of its building type (i.e. in opposition to all other building types) and secondly on a connotative level on the basis of style (i.e. in opposition to the other ways that the same function might have been achieved). This double classification is, Krampen maintains, a necessary sequence in building recognition. He even goes so far as to say that 'before one can recognize stylistic differences between churches, for example, one must be able to recognize the difference between churches and other building types'.

Krampen uses this model as a basis for structuring two related sets of research studies, one set focusing on building type recognition and the other on reactions to building styles. As the logic of his recognition model suggests, Krampen's argument for treating these two sets of studies separately is that 'once the function of an architectural object has been ascertained, an independent study of its style becomes possible'. However, here is where Krampen's carefully constructed model seems to be flawed. While it is true that most laypeople seem to follow this recognition sequence, not all people do (Groat, 1979). Architects in particular are quite often content to view style or form in total disassociation from building type. Though Krampen argues that his model is supported by the data analyses he carries out on his building type studies, this reader is not entirely convinced. At the very least, the distinction he draws in these analyses between denotative and connotative design features seems obscure.

Despite these ambiguities, the individual studies can still serve as useful models for subsequent empirical research. With reference to the building type studies, for instance, both the substantive findings and methodology are of potential interest to other environmental psychologists. The major focus of these studies was to determine the critical level of formal detail necessary for recognition of building types. Krampen was able to conclude that the most significant cues were: (1) size (in part conveyed by size and number of windows), and (2) homogeniety of building volume and form. These findings clearly have importance for architects who wish to 'communicate' effectively with users. In addition, the relevance of such studies for architectural practice suggests that other similar studies would be equally valuable. One such study by Young (1979) has yielded results which are quite compatible with Krampen's.

The other important aspect of Krampen's building type studies is his use of the sorting task as a research methodology. Krampen's procedure was to ask subjects to sort pictures of buildings into categories of building types. Given the model of building recognition as an act of classification, this methodology appears to be entirely appropriate. A further elaboration of this procedure is the *multiple* sorting task which Groat and Canter (forthcoming book) have used in studies which sought to uncover the range of meanings evoked by particular places. In these variations the subject is asked to sort pictures (or concepts, or parts of buildings) into groups on the basis of any criteria (meanings) which the subject considers significant. The success of this procedure to date suggests that it holds much promise in future research.

Krampen's second set of studies explores the connotative meanings of buildings. Here, environmental psychologists ought to find Krampen's analysis of the semantic differential technique and his application of it to semiologically based research of considerable interest. Krampen presents a wealth of commentaries on the value and

shortcomings of the semantic differential and ultimately concludes that it is particularly well-suited to studies in which the subjects are required 'to distinguish between different styles of one functional category.' But this of course leaves open the possibility that the semantic differential might not be nearly so applicable should it be determined that stylistic meaning is not in fact subordinate to functional meaning.

A final observation of Krampen's work (and one which applies also to both BBJ's and Bonta's) is that these semiologically oriented analyses have focused almost exclusively on the formal details of building facades. Little or nothing is said about interior space, let alone the non-visual experience of architecture. Jencks (1977) has made passing mention of these other meanings, but as yet no careful semiotic analyses of interior space has been forthcoming. Perhaps then one is forced to wonder if semiotics is capable of describing these other meaningful experiences of architecture.

Incorporating Spatial Meanings in the Design Process

In this light, Glenn Lym's *The Psychology of Building* emerges as a refreshing counterpoint to the semiotic contingent. A practicing architect and a trained psychologist, he has completely eschewed not only the jargon of semiotics but also the exclusive preoccupation with form. Instead he directs his attention to the meanings that particular spaces and spatial relationships can have for people in a clear and concise text that ought to be well appreciated by the non-specialist audience he is writing for.

It would be a mistake to assume, however, that in writing for non-academic readers Lym has failed to contribute to the environmental psychology literature. In fact, the case is quite the opposite. Perhaps the most salient aspect of Lym's analysis of spatial meaning is his reversal of the conventional S-R model. Despite the stance of most environmental psychologists that the man-environment relationship is an interactive one, many research studies emphasize the effect of the stimulus (environment) on user reponse. Lym, however, turns this approach on its head and takes a look instead at the way in which people manipulate space in order to resolve or reinforce particular sets of meanings.

For example, Lym describes in detail the experiences of several individuals who have elaborated in their own homes the physical embodiment of their cognitive spatial orders. By spatial order Lym means each person's own spatial vision, or system of meanings associated with spatial relationships. Lym concludes that these people have 'used housing to reflect upon and to help come to terms with themselves'.

Lym extends this argument further to suggest that this propensity to manipulate space on the basis of personal expression is a trait that both architects and laypeople share in common. Thus he takes issue with certain vocal critics who seems to be arguing that architects should abandon all tendencies toward personal expression in an effort to meet functional user needs. Lym is arguing in effect that users and clients have just as much need for personal expression as architects and, in a sense, that every man is an architect.

Lym sees important implications here for the design process. Since architects and their clients will both have a need to see their own spatial orders realized, and since also there is no guarantee that these visions will be compatible, he argues that the design process must be structured in such a way that the full range of the participants' spatial orders is embraced. To clarify his point, Lym presents the design process of

three separate projects and then analyzes the success of each design based on the extent to which the spatial orders of the client/users have been incorporated. Lym's prescription for the design is a tall order, but it one that deserves to be taken seriously. Clearly, one implication is that empirical research can help to identify the nature and quality of the client/users' spatial orders. Lym himself does not suggest the empirical methodology that might be most appropriate in this situation; that is a challenge for other researchers to address.

Architectural Critiques as a Source for Empirical Hypotheses

Another recent book which attempts to address the question of how architects might go about producing building resonant with meaning is William Hubbard's *Complicity and Conviction: Steps toward an Architecture of Convention*. Hubbard is, like Lym, a practicing architect. What he offers in this book is his vision of the guiding design principles which might ensure the production of an architecture of convention, one that is both rooted to past traditions and bound to the present in such a way that it 'gives testament to human values'.

In Hubbard's choice of title, *Complicity and Conviction*, he has set himself in opposition to an act which is very hard to follow, namely Robert Venturi's *Complexity and Contradiction in Architecture* (1966) which is considered a landmark publication in architecture. Venturi's purpose was to demonstrate architectural precedents for complex and contradictory (read meaningful) formal devices and to argue for their value in contemporary architecture. Venturi's principles are considered to be a source for the recent trend called Post-Modernism (though paradoxically Venturi still calls himself a Modernist).

Hubbard's argument is that the current crop of Post-Modern buildings have failed to produce an architecture that truly 'engages' its audience. What he means by an engaging architecture appears to be one which feels 'so right' that the audience wouldn't want it to be any other way. How he determines when a building succeeds at this he leaves rather vague, but in any case he is convinced that Post-Modernism fails to do so.

Hubbard then proceeds to examine other human activities which might serve to provide models for an architecture of convention. The first of the three endeavours he cites is games, which in fact are the source of his notion of complicity and conviction. Games, he argues, are conventions which show us that 'believing in something we have set up will happen only if the set-up embodies the kinds of ideals that engender conviction and only if we offer our complicity to that set-up'. Here it appears that he touches on a basic theme of semiotics, the notion that rules (whether in football or linguistics) are a set-up to which we offer our complicity. However, Hubbard adds to this the important principle that more complex human artifacts, like games or architecture, must embody ideals which inspire conviction in them.

Hubbard's second model, that of typography, appears less convincing than the first, though the principle he derives from it has a long and respected tradition in the history of aesthetics. In analyzing the rationale for the design of a particular typeface he maintains that 'we will hold conviction about the things we create only if we can keep discovering within those creations, new reasons for wanting them to be that way'. This echoes the notion of 'levels of meaning' that Venturi himself has argued

for; and which in turn derives from some of the principles exposed by the group of literary critics who formulated what was known as the New Criticism.

It is Hubbard's third model, the law, which assumes the major focus of the book. Hubbard's point here is that an architecture of convention can be articulated by the example of how judges construct rulings. A significant aspect of this procedure is the way judges tie their decisions to past precedents and provide potential links to future ones. Hubbard elaborately traces a set of cases having to do with merchantile law. He then summarizes the six underlying principles by which judges at the end of the 116-year tradition could frame decisions which were not only consistent with the earliest precedents but which also reflected the values of the times.

Hubbard then evaluates two examples of university architecture—the University of Virginia by Thomas Jefferson and Kresge College at University of California, Santa Cruz by Moore and Turnbull—in terms of the entire set of six principles. (Later on he applies certain of the principles to other contemporary buildings in a less detailed critical format.) His conclusion is that both Jefferson and Moore/Turnbull have unconsciously applied these principles to their buildings and consequently have produced an architecture which speaks of human values and engages the audience. Furthermore, taking his argument to its logical conclusion, he maintains that Kresge College embodies ideals more relevant to these times and is therefore the more appropriate and engaging architecture.

Paradoxically, this final argument echoes the old Modernist idea, and to some extent discredited belief, of the Zeitgeist, or spirit of the age. That argument held that Modern architecture was the appropriate solution because it reflected its times and was therefore not counterfeit. Hubbard's response to this might well be that the Modernist pitfall can be avoided by securely tying an architecture of the times to past precedents. But what mechanism will ensure that appropriate precedents are sensitively reworked while reflecting the values of the times?

Here is where some thoughtful empirical work is called for. An obvious approach would be to operationalize at least some of Hubbard's six principles and test people's responses to real buildings. Needless to say, certain of the principles are more likely candidates for effective testing than others. Two in particular might serve as examples. Hubbard has argued that: (1) architects ought to bind their buildings to past precedents; and (2) they have a responsibility to see that 'the works likely to come to a person's mind are works that the person could read as having a comparable intent'. Thus, a useful research strategy would be to discover what (or if) precedents have been conjured up in the user's mind, and in addition whether those precedents evoke the intended meanings.

A second source of empirical research design is the set of notable and significant buildings that Hubbard, as well as some of the other authors, have presented as examples in their discussions. One interesting coincidence in the current lot of books is Lym's and Hubbard's use of Kresge College as a focus of detailed analysis. Lym has actually conducted interviews with the clients, users, and architects; and he concludes that the design in fact successfully encompassed the range of spatial orders that past and present users needed to have realized. Although Lym's study tends to support Hubbard's view, one still wonders if Hubbard's other evaluations would have been equally well supported by empirical study.

Examples such as this suggest that evaluations of significant buildings which are held in esteem by the architectural profession can and should be an important

component of environmental psychology research. Since the current architectural literature often takes great liberties in interpreting the meanings that a building might have for people, environmental psychologists can fulfill an important role by testing the assumptions of the design profession, whether these assumptions be the product of semiological theory or the madcap fantasies of an influential architect.

Summary

The direction that contemporary architecture takes in the next few years will in large measure depend on how the issue of meaning in architecture comes to be resolved by the architectural profession. Environmental psychologists have the potential for playing a significant role in this debate so long as they are able to link their work to both in the theoretical and formal issues pertinent to that debate. The five books reviewed in this article offer some important clues for how environmental psychologists might enter this discussion. The Broadbent, Bunt, and Jencks collection provides an overview of the relevant theoretical issues in architectural semiotics; Bonta's work on architectural criticisms links semiotic analysis to certain appropriate psychological concepts; while Krampen elaborates these potential links by offering a semiologically-based model appropriate for empirical research. In contrast, Lym offers an alternative empirical model by demonstrating how spatial meaning can be investigated without reference to semiological analysis. And finally, by presenting a post-Post-Modern vision of a meaningful architecture, Hubbard provides both a theoretical model and examples of built form which might be usefully tested. The diversity of approaches to the topic of meaning in architecture represented by these five books suggests that there is more than enough room for environmental psychologists to join in.

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Manuscript received: 30 November 1980
Revised manuscript received: 12 January 1981

Journal of Environmental Psychology (1981) **1**, 86–96

Architecture for people. Explorations in a New Humane Environment Edited by Byron Mikellides.
London: Studio Vista. 1980, 192 pp. £12.95

Reviewed by **James R. Watzke, Jr.**

Byron Mikellides has been senior lecturer in environmental and social psychology at Oxford Polytechnic since 1968. He specializes in the discipline of architectural psychology with special emphasis on perception. A regular contributor to architectural psychology conferences, he has lectured extensively in Europe and the United States.

James R. Watzke, Jr. completed his undergraduate education in psychology at the University of California, Berkeley and is now a doctorate student in environmental psychology at the University of Lund, Sweden. His special interests lie with the elderly and he is currently involved with environmental research related to retirement and personality.

Architecture for People is a collection of 18 essays reflecting some current thoughts about humane architecture. The editor's acknowledged liberal editing strategy towards the content of the contributions produced a book which is best seen as a group of essays, giving it a rather personal feeling. Those readers seeking a more structured traditional textbook approach, such books exist, e.g. Rapoport's 'Human aspects of urban form' (1977).

Since 13 of the 18 contributors have architectural backgrounds, it is likely this book will be most comfortably read by the architects in the field. This attention to the architect's perspective seems one of the best reasons for non-architects, particularly researchers in environmental psychology, to read the book. At the same time, the book has a more theoretical side to it, mainly due to the chapters concerned with aesthetics and psychology. It is in the fields of biology, physiology, and psychology that 'people information' of potential use to the architect is to be found. Examples of such scientific information, specifically adapted to man-environment problems, appear in this book and should be of interest to all professionals in the field.

The essays as a whole provide an excellent sample of how some of today's leading design and research professionals are conceptualizing and answering the challenge of humanizing our built environments. Many of the topics center around user participation and the design process, the affirmation of architecture as an art, and the changing role of the architect. Many practical discussions of actual design projects are found and with respect to user participation, the chapters discussing the work of practicing architects Lucien Kroll and Ralph Erskine offer detailed examples of how user's input can lead to more human designs. At least five of the writers discuss the artistic factor in architecture as well as designing as a creative process. If there is a consensus here, it is that the design process does not lend itself easily to systematization. The role of the architect of course is seen differently by the various writers but there seems to be a common appeal for the architect to take on a more 'serving' role, whether he may be serving a perception of culture and life, a belief in allowing people to be involved in their environments, or a general list of human needs.

Robert Maguire's chapter 'A conflict between art and life?' is a sound and vigorous discussion of these topics. One of his concluding remarks merits quoting:

'no "architect" who does not exercise these (creative) faculties in the service of life is really practising architecture at all, although he may be practising something else, such as sculptural self-expression, quite successfully' (p. 133).

Three chapters take up the topic of aesthetics: the articles by Nicholas Humphrey and Peter Smith offer some of the latest theoretical thoughts in this area and show how aesthetics today is much more than 'a branch of philosophy dealing with beauty and the beautiful'. Humphrey presents a thorough argument claiming man has evolved a sense of pleasure in classifying and perceiving 'rhyme'—agreement with some disagreement, between the objects in his environment. Citing many common examples from nature as well as experimental psychological research (e.g. novel stimuli reinforcement, and discrepancy theory), he suggests an architect who might be able to 'emulate these structures of rhyme' at his drawing board would be on his way to design pleasing environments.

Similar in theoretical perspective as Humphrey's essay, Peter Smith offers a more architecture-specific and more physiologically-based explanation of positive aesthetic perception in terms of '... an alliance between the higher intuitive aesthetic values and those stemming mainly from the limbic brain' (p. 86). Lastly, Rikard Küller's chapter 'Architecture and emotions' compared to Humphrey's and Smith's is a more applied discussion of some of his research relating perceived qualities of environment to four basic emotional dimensions: activation, attention, evaluation, and control. Although he admits models of man–environment relationships are highly complex, the type of research described in his chapter may be some of the most understandable and immediately useful information for architects concerned with the impact of built environments on people.

Another group of essays might be placed loosely under the heading of planning and technology. Here, Kenneth Frampton's detailed analysis of the Volvo factory built in Kalmar, Sweden is an interesting attempt at relating the architectural, technological, and labor–management factors inherent in all industrial work settings. Among other points, Frampton seems to be warning us of a type of token humanism carefully tempered by the profit motive which may be going into the design of modern work environments. The essay by the late biochemist Gösta Ehrensvärd not only offers some clear thoughts on ecology and the biosphere, but also about the importance of allowing diversification of individuals' environments.

The contributions by Peter Stringer and Byron Mikellides discuss, among other things, the nature and needs of people. Stringer uses a three-dimensional model of man (organismic, role, and relational) to show that how the architect conceives of his user's relationship to the environment and to other people can lead to different design solutions. Most importantly, the essay is a good realistic example of how psychological theory can be reformulated into models (of people) useful to the architect as a necessary consideration in his complex design process.

The chapter by Mikellides begins with a historical perspective on architectural psychology as an academic field. The structure for his humor-injected summary (cartoons included) is provided by the architectural–psychology conferences which took place from 1969–1976 and will be appreciated, especially by newcomers to the field. Through the course of his essay, Mikellides offers his own balanced set of opinions on the role of psychology in architecture, the systematization of the design

approach, as well as his own definition of art in architecture and the changing role of today's architect. Lastly, he discusses in more detail an architecture for people based on understanding of human needs drawn from the works of psychologists like Maslow, Argyle and Gehl. The editor's chapter provides a suitable context for the basically independent essays which follow.

In concluding, the editor's efforts are to be commended because the group of essays not only offers an insightful practical and theoretical discussion on a wide range of worthy topics, but it also presents this discussion leveling little or no guilt or blame on the various professional groups making up the field of architectural psychology. This is important because we can all look around us and see how much more understanding and co-ordination of all peoples' interests is needed to improve our built environments. *Architecture for People* is a book in this direction.

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The Hippocampus as a Cognitive Map. By John O'Keefe and Lynn Nadel Oxford: Clarendon/Oxford University Press. 1978, 584 pp. £25.00

Reviewed by **John Breaux**

John O'Keefe and Lynn Nadel received their postgraduate training at McGill University where both were influenced by D. O. Hebb. Their subsequent research culminating in the present volume was undertaken while honorary fellows of the Cerebral Functions Group, Department of Anatomy, University College, London.

John Breaux received his D.Phil from Oxford University. He is a member of the Fire Research Unit, University of Surrey and Wolfson College, Oxford. From July 1981 he will direct research at the Institute for Education and Behavioural Cybernetics, Villafranca, Leon, Spain.

The notion of space pervades and poses problems for numerous present-day disciplines including mathematics, cosmology, logic, psychology and behavioural cybernetics. When translated into human terms the immediacy of space calls to fore an individual's ability to navigate, have a 'feeling' for distance, and realize, more or less accurately, where he or she is.

It is possible to focus on the nature of distance *per se*, e.g. Shreider (1974); the genesis of spatial awareness in children, e.g. Piaget and Inhelder (1956); or the neurological correlates of space perception, e.g. Benton (1969) to name but a few facets of the spatial concept to come under detailed scientific scrutiny in recent years.

It is the neurological perspective which is discussed by O'Keefe and Nadel. Before commenting in detail on their book, a word of warning. Prospective readers hoping to gain insight into the more ephemeral connotations of place, e.g. as an aesthetic or existential entity, may be ill-served. However a possible resolution of such interests with the present material is raised below.

Although consisting of fifteen chapters the book can be regarded as falling into

three main sections logically presented. The authors begin with a review and discussion of previous thinking about space, distinguishing between absolute and relative or egocentric spatial perspectives. This is achieved by tracing the complex arguments of Newton, Leibnitz, Berkeley, and Kant, followed by contributions of classical psychology culminating in such concepts as Gibson's perceptual invariance and the role given to movement in defining space by Piaget, and earlier, Poincare.

The next main section provides both a model of how the hippocampus might function as a map generator and subsequently reviews an amazing number of neurological and behavioural studies on infrahuman subjects with the object of reconciling model with data and resolving contradictory research results. This is by far the largest part of the book and central to the main thesis. Indeed, the book and more specifically the position advocated originally stems from the work of O'Keefe and Dostrovsky (1971). This theory has two major components. First, there is the proposition that an organism can have two senses of space, a *taxon* or route perspective based on egocentric space, and a *locale* or map oriented perspective with an underlying unitary or absolute spatial framework.

Further to this proposition it is argued that short-term memory and context-dependent recall attach to the latter. The second proposition of this theory proposes that the locale system, so essential to a coherent existence, has its neurological locus in the hippocampus.

Although an interesting model the reader will appreciate that much of it is linked to what one can do with and what is known about the rat. The spartan environments in which such subjects are evaluated also make it difficult to project the observed effects to higher mammals and occasionally one suspects that the predominant factor underlying place unit firing is the rat's acute olfactory sense (perhaps he smells where he has been). The reliability of a model which rests heavily on data from single cell recording techniques is, in part, a function of the systematic sampling of relevant cell populations. Hippocampal research to date does not yet suggest that this can be taken as fulfilled although due to the organization of the structure in question this might be less incisive. Not all the studies reviewed are consistent with the theory but the authors often integrate these convincingly.

The final section is an attempt to extrapolate the theory to human beings and use it to account for those deficits associated with the amnesic syndrome. It is argued that in humans the locale system is crucial to the representation of experience within specific contexts. Moreover, not only space but semantic ability is implicated by the system. To achieve the synthesis the authors propose that imagery derives not from reference to stored pictures in the head but a propositional mapping such that relationships embodied in an image define it and permit its reconstruction. The 'software' underlying this capability is suggested to be a deep structure, propositional and transformation mapping scheme sited in the right hippocampus. Extending the hippocampal map concept O'Keefe and Nadel subsume context specific linguistic ability by suggesting that instead of locations, non-spatial maps depict semantic relationships. These non-spatial or semantic maps are located in the left hippocampus and also rely on a propositional scheme for their realization. The particular scheme nominated is of the componential variety and it is here that the authors can be seen as demanding too much of the hippocampus. In putting forward Jackendoff's (1976) propositional system many difficulties in the sheer implementation of the transforms are not mentioned. Similarly, contrary to the impression conveyed by the examples given,

componential schemes are laden with ambiguities. It is not always clear how a particular phrase might be represented at a more fundamental, unambiguous, level. If, in fact, humans employ a componential system like that suggested, then the ability to both employ and appreciate the operations involved implies considerable cortical involvement beyond the hippocampus.

In any event, it is a poor bet to rely totally on relational or propositional systems to account for image and semantic reconstruction. How would it account for instances of vivid visual imagery beyond the sixty second limit usually associated with short-term or iconic memory. Also, as explicated, a propositional paradigm would be unable to account for the ability to recognize as complex an object as a face from an infinite number of orientations.

The above remarks notwithstanding the theory does provide a framework for systematizing a considerable body of research on human memory in both intact and brain-damaged people. It is both an extension and refinement of the link between memory and the hippocampus originally reported by Scoville and Milner (1957). Although not all research is in agreement, O'Keefe and Nadel propose that once the hippocampus is damaged, data from the locale system is more than inaccessible, it is unavailable. This is a sharp albeit speculative reply to the recurrent question of whether storage or recall is at the root of impaired performance in such cases. A major problem here, and one which the authors themselves raise, is the diffuse nature of injuries in the amnesic sample. One simply cannot be sure which cortical structures are involved in the observed deficits the hippocampal theory seeks to explain. While often including the hippocampus many of the unfortunates surveyed indicate more extensive damage.

At the start of this review a possible reconciliation of the present material with 'softer' notions of place was promised. At one point O'Keefe and Nadel suggest this when it is stated that, 'information pertaining to values ... is attached to an output from a veridical map. (p. 77)'. the authors recognize the importance of egocentric perception and attendant valences for the appreciation of given locations. Their theory however stresses the subordinate and 'add-on' characteristics of these features relative to veridical maps of absolute space, that is, the type of map assumed to be represented in the locale system. But it is questionable whether this representation is as autonomous as suggested here. Existing evidence does not preclude the possibility that egocentric and veridical systems interact to define each other to some degree.

In summary the book presents an interesting unifying theory and impressive incorporation of available evidence. Nonetheless as applied to people it remains to be shown that the hippocampus *per se* is really as central to critical abilities as suggested by the theory.

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Why Families Move. By Peter H. Rossi
Sage Publications, Inc., Beverly Hills and London, 1980. 2nd Edition, 243 pp., tables, bibliography, index. £5.95 (paper) £11.25 (hardback)

Reviewed by **Barrie S. Morgan**

Peter H. Rossi is currently Professor of Sociology and Director of the Social and Demographic Research Centre at the University of Massachusetts, Amherst. He has been on the faculties of Harvard, John Hopkins and Chicago University. His research has largely been concerned with the application of social research methods to social issues. He is currently (1979–1980) serving as President of the American Sociological Association.

Barrie S. Morgan graduated at the University of Exeter, where he also studied for his doctorate. He has been Lecturer in Geography at King's College London since 1968. His research has largely been concerned with the residential structure of cities, and he has published a range of papers on the bases, and effects, of residential segregation, and on intra-urban mobility.

This is a second edition, after twenty-five years, of a now classic text, with the addition of a preface by W. A. V. Clarke and a 35-page introduction by Rossi. It is particularly welcome since, at least in the United Kingdom, very few copies of the first edition are available; even the British Library of Political and Economic Science is without a copy. The present reviewer finds himself in the unusual position of retrospectively assessing a contribution which was more-or-less dismissed by the original reviewers in 1955. As Rossi points out (p. 17), one reviewer berated him for turning into the 'Kinsey of the moving industry'. Another stressed the 'fact' that we all 'knew' residential mobility was mainly a manifestation of social mobility and, therefore, the monograph, which emphasized the role of family cycle changes, was simply wrong. As a consequence, Rossi left the field of mobility research and moved on to other substantive concerns (p. 18).

Why Families Move is an empirical study, which employs survey research techniques to examine residential mobility in four, purposively chosen, census tracts in Philadelphia: a high status, high mobility area; a high status, low mobility area; a low status, high mobility area; and, a low status, low mobility area. Over 900 households were questioned about their housing attitudes and moving intentions. A follow-up survey eight months later established whether they had moved or stayed. The report consists of three major sections. The first section describes the distinguishing features of the areas and the respondents' perceptions of the local environment along with the degree of household interaction within them. It goes on to assess the effects of mobility on personal ties and local organizations. The focus of interest in the second part shifts from the area to the household. It investigates the social characteristics which differentiate households planning to move from those expecting to stay as well as the sources of residential dissatisfaction, with a view to understanding the relationship between household characteristics, complaints, mobility intentions and the decision to move. The last part investigates the decision to move in more detail. Reasons for moving are divided into 'push' and 'pull' factors. The relative importance of a factor is assessed by comparing the number of times it was stipulated as important

by movers with the number of times it was mentioned as an influence on the decision to move.

Rossi's conclusion that 'mobility (is) the process by which families adjust their housing to the housing needs that are generated by the shifts in family composition that accompany life cycle changes' (p. 61) is not only the most quoted sentence from *Why Families Move* but probably the most frequently cited conclusion from what must now be several hundred analyses of intra-urban mobility. This is unfortunate as it focuses attention on one of the few weak links in a tightly designed and reported research programme. The frequency with which it is cited owes more to the fact that Rossi was the first to postulate the pre-eminence of life cycle factors (which subsequent research has largely confirmed) rather than the evidence he marshalled to support this hypothesis.

This reviewer has argued in detail elsewhere (Morgan, 1974) that Rossi's findings—that younger households are more mobile than older and that the most common complaints are about housing space—do not justify his attributing such pre-eminence to life cycle changes. One general point bears repetition since many subsequent analyses have followed where Rossi led. Complaints about housing space are not necessarily indicative of growing pressure on space. Coupe and Morgan (1981) have demonstrated that one-third of the households who cited the desire for more housing space as the major reason for moving within Northampton, England, were not moving in response to the pressures of a growing family. They simply wanted more space for its own sake or for reasons of social prestige. Many of Rossi's respondents may have been similarly motivated since they considered such things as outside appearance and neighbourhood reputation as more important attributes of a new house than number of rooms (see his Table 9.7).

But the object of this review is not to follow most of the initial reviewers and bury *Why Families Move* but to praise its second edition. The first edition shifted the emphasis of mobility research from its imagined effects on social pathology and from deterministic modelling to the movement decisions of individual households and explanatory concepts drawn from social psychology. Re-reading the complete text rather than referring to well-thumbed photo-copies of particular sections, its breadth of vision, along with its conceptualization of mobility as a process and its methodological innovativeness, is striking. All the basic concepts of the behavioural model of migration developed later by Brown and Moore (1970) and Speare *et al.* (1975) can be traced back to this study: for example, the notion that underpins the monograph that mobility is a response to households' perceptions of changes in their relationship with their residential environment; the recognition of a threshold prompting residential mobility (p. 152); and the three-stage accounting scheme to partition the movement process (p. 221). It is difficult to escape the conclusion that these later writers did little more than formalize and jargonize Rossi's concepts.

But while Rossi's analysis is based on the implicit assumption that households control their own destiny with respect to mobility decisions, he continually emphasizes the importance of the housing market and housing costs in constraining their freedom of action. As he points out, a household frequently has to decide what housing features it is prepared to compromise in order to maximise the feature it is particularly desirous of obtaining. For example, in order to obtain a home which has the right number of rooms, it may have to accept a dwelling which is less ideal than others with respect to age, location and so on. It is particularly unfortunate that his pioneer-

ing attempt to investigate this, by means of an index of incompatibility (pp. 213–216), has not been followed up. Instead, many of the behavioural studies which followed gave undue weight to the choice element in a household's decision, which make them easy prey for criticism by modern students of residential structure (for example Duncan, 1976) who argue that the constraints imposed by the institutions of the housing market rather than the choices of individual households are the key to understanding urban processes.

Rossi's introduction to the second edition includes a perceptive and informative discussion of the conceptual and measurement issues in mobility research as a prelude to a summary of our current knowledge. The latter is rather superficial and does not do justice to the wealth of literature on the subject. While there are several comprehensive literature reviews (for example, Quigley and Weinberg, 1976) this reviewer at least would have appreciated a more critical assessment of mobility research since 1955.

As W. A. V. Clark says in his preface to the present edition. 'This, then, is a truly remarkable contribution to the development of a field of study, (which) has made a lasting contribution at both the empirical and conceptual levels ... It has been and will continue to be basic reading for all students in residential mobility' (pp. 11, 12). At the same time, it is disturbing to reflect that potentially valuable parts of the methodology and analysis still appear to be innovative in 1981.

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Architecture and You. How to Experience and Enjoy Building. By W. W. Caudill, W. M. Pena and P. Kennon
Architectural Press, London: 1978, 176 pp. £9.25

Reviewed by **Peter F. Smith**

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William Merriweather Pena is the firm's Senior Vice President, and Paul Kennon is its President and Chief Executive Officer. He was formerly the Associate Director of the School of Architecture at Rice University.

Peter F. Smith is a Senior Lecturer and Director of Postgraduate Research in the Department of Architecture at Sheffield University. He is also the Senior Partner of Ferguson Smith and Partners, Architects and Planners. His publications have been concerned with many aspects of architecture including symbolism, architecture and religion, urbanism, and architectural aesthetics. He is a Fellow of the RIBA and the Royal Society of Arts.

'What is architecture about and how is it perceived? That's what this book is about' (p. 6). So begins what might be called a plain man's guide to architecture. The authors claim it is 'a book with the simplicity that experience and knowledge can give', conceived with the layman in mind.

It begins by proposing three dimensions of man—the physical; the emotional and the intellectual. Architecture is said to comprise all three.

Then it introduces the basics—the outside and the inside, mass and volume. Space is shown to be static or dynamic (in the sense that it can flow). Form is reduced to three fundamentals—plastic, skeletal and planar or put another way, solid, framed and layered. Buildings across the ages are organized into these categories.

Subsequent chapters deal with the intricacies of the building envelope; materials and detailing; style; scale. The latter is divided into associative and effective categories. The first has to do with scale as a function of human size, the second with appropriateness and individual perception.

The authors make a strong plea for daylight in buildings. 'Light is the catalyst of space and form' (p. 96), it causes architecture to happen. It has different qualities depending on whether it is experienced in Maine or Mexico, summer or winter.

The chapter on psychological environment deals with the superficialities of environmental psychology. There is a condensed run-down of some of the conclusions of the science over the last two decades. Symbolism is also superficially dealt with. It seems to be mainly a matter of authenticity or phoniness which is said to erode 'logical form' and 'is a revelation of the thinness of the culture', (p. 115).

Further chapters deal with architecture's response to individual and social needs; economy; and energy. Here the authors are on more stable ground. They rightly condemn the profigacy of the 60s and suggest that, in future 'energy will be the new form-giver' (p. 138). There is a useful summary of methods of exploiting solar energy.

An interesting chapter considers the effect of time on architecture; how our values change; how in time we can come to like pacesetting architecture like Notre Dame de Haut, Ronchamp. Some buildings cannot hold their quality over time, others 'have an explicit sustaining quality' (p. 140).

Chapter twelve is a one-page conclusion, a wrap-up or thumbnail summary. Following this there is a glossary, a list of architects, mostly from the U.S.A., and a specimen set of questions for arriving at an evaluation based on the four pillars of architecture: Function, Form, Economy and Time. To conclude, there is an extensive list of places to experience architecture which is confined to the United States. There is also a bibliography and a reading list.

To appreciate this book I have had to overcome certain old-fashioned prejudices like the belief that sentences should contain verbs. It is written in a style which is direct, pedagogic, and punctuated with staccato aphorisms. There are no great insights but many small ones which are often poetically wrapped, for example: 'First rate buildings speak in no uncertain terms with clarity and simplicity. Mediocre buildings stutter'. One is given a jolt by an observation such as: 'One large building can cause

the destruction of a forest, just for the electricity it uses' (p. 139). There is nothing new about the cautionary note that 'The sin of sins will be to design obese buildings having insatiable appetites for consuming energy' (p. 140). It is the metaphor which makes it memorable.

Everywhere there are value judgements, some of which suggest the prejudices of the modern movement. For example, we have to be honest about materials and therefore the Parthenon is less than perfect because, on its entablature, the dentil's are a stylization of wood construction and therefore are 'dishonest'. What about the trygliphs and metopes which express timber beam origins? To be this purist will be meaningless to the layman.

Inevitably there are sweeping generalizations, some of which could be dangerous, like the assertion that there are two types of wall, internal and external and that internal walls are mostly non-loadbearing. And did you know that 'next to sliced bread, central heating was the greatest technological advancement of the century' (p. 136)?

The photographs are beautiful, though it would have been better to have had their full description in the captions rather than at the end of the book.

From these few quotations it will be evident that this book can be both entertaining and irritating. Its epigrammatic style with touches of condescension might antagonize the more conservative reader. Nevertheless, it has much to offer once one has become accustomed to communication by detonation. These three architects in explaining architecture by pooling their experience have done a good job.

I wish I had learnt earlier, e.g. that 'old people in nursing homes die sooner at the end of halls' (p. 105). If it means what I think, then I have condemned numerous old folk to a premature end!

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Printed in Great Britain by Fletcher & Son Ltd, Norwich